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Vol. 72, No. 25 New York, December 21, 1918 Pages 1161--1208

# Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

Member Audit Bureau of Circulations, Member Associated Business Papers, Inc.

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Circulation of this issue 18,500 copies

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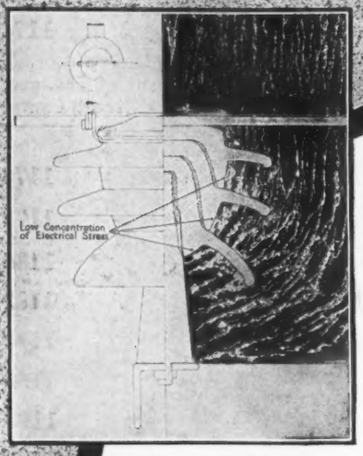


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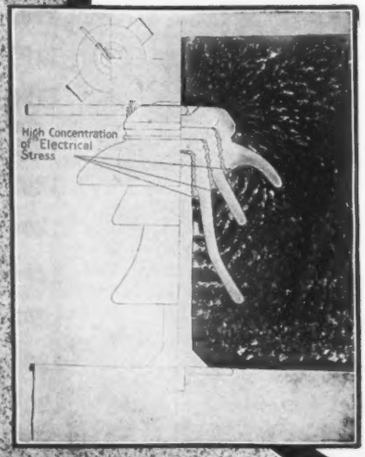


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# Electrical World

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*Volume* 72 New York, Saturday, December 21, 1918 *Number* 25

## The Business Outlook

PROGRESS is being made in readjustment of industrial conditions in this country while the stage for the momentous Paris peace conference nears completion. Prices of some steel products are to be reduced, and the keynote of the pending reconstruction in the steel industry now is that it will be lower return to capital rather than lower return to labor which will prevail. Keen interest is felt in the new copper price to apply after Jan. 1. Sales and quotations below 26 cents are reported. Stocks in producers' hands are enormous, but consumers are holding off, and if the new price is low enough it will invite large buying. Some heating devices will be reduced in price and, with continued employment of labor at high wages, buying in this class of electrical supplies will be stimulated. Labor is still much needed in many lines of industry, and returned soldiers find jobs awaiting them. Employers will try to encourage greater efficiency. Special building requirements in some cities will be met in spite of all deterrents of cost, but new construction as a whole will await the readjustment of markets now in process and relaxation in capital. Certain elements in the administration party at Washington continue to direct their influence and official acts to swing the country to a policy of public ownership of carriers and communication lines.

*Economic coöperation is going to be one of the keynotes of the reconstruction period, and whether an engineer believes that interconnection will pay or not in a given case he will do well to analyze its prospects.*

## Non-Active Committee Members

IT HAS been claimed by some men with demagogic tendencies that the results accomplished by a committee are inversely as the cube of the number of its members. While this trouble may be present when the members of a committee faithfully attend the meetings, a trouble of a different kind arises when the members of a committee are scattered from Maine to California. This is the situation that confronts some of the committees in our national engineering societies. Many members accept an appointment or simply acquiesce in having their name put on a committee without realizing the responsibilities which such an appointment carries with it—or ought to carry. Such an attitude leaves the chairman in the embarrassing dilemma of either not accomplishing anything or passing resolutions and writing reports in the name of his committee when he is really the only one responsible for them. As a result, the membership at large often suffers in the end because of the lowering of the grade of the work done by the societies and because there is a temptation for a few to control these societies to suit themselves. The evil is widespread and deserves serious consideration.

*An intelligent understanding of the real value of water powers as a national asset and the best uses to which they may be put is evidently lacking in Washington. On no other ground can one account for the lack of action on pending legislation.*

## Help the Contractor to Help Himself

CO-OPERATION as a mere slogan bandied about in the hope that it will do something to weld different branches of the industry together is liable to abuse. To attain the end sought it has to receive consistent, untiring attention from those who want to get and give its benefits. In the past we have seen it trifled with by some who did not appreciate its full meaning, misunderstood by others and selfishly interpreted by those who wanted to take its profits unto themselves. What is needed is to dismiss it as a term, but to look upon it as a matter of policy, a thing of naturally slow growth or evolution. Its possibilities as a help in the development of the industry will then be greatly strengthened. Such a policy of coöperation is apparently in process of development between the jobbers and the dealer-contractors.

Dealers and contractors have much to hope for from the jobbers. The jobbers have a thorough understanding of the problems of the dealer-contractors and are capable of being "big brothers" to any movement which is sincerely intended to benefit the "last link in the chain." The contractors have been struggling manfully to establish the association which was launched at a time of adverse seas and winds. They have reached a point where some of the larger opportunities arising from the new world era will soon be upon them, and they need friendly counsel in profiting from these opportunities. Naturally they are in close contact with the jobbers, and harmony in the relations of these two branches will undoubtedly be of value in speeding the growth of the industry as a whole.

President W. Creighton Peet of the contractor-dealers' association undoubtedly voiced the opinion of its members when he appeared last week by invitation before the Electrical Supply Jobbers' Association at Cleveland to express the desire for more intimate relations. We trust that Mr. Peet's request for the attendance of jobbers at the meetings of the executive committee of the contractor-dealers' association as well

as at the annual conventions of that association will be complied with. There is a real educational work to be done among the smaller contractors, and for the good of the industry it cannot be started too soon or continued too zealously. The jobber can help the contractor, the jobber should help the contractor to fill the place which that small dealer is fitted by location and neighborhood contact to fill with general advantage to all.

*If the same governmental time lag is to be encountered after the war as before the war, every industry will do well to tackle its reconstruction problems and settle them quickly; because soon we shall demobilize at the rate of 15,000 men a day and the problem of how to absorb them will require undivided attention.*

## Burning Poor Fuel

THE zone system of fuel distribution, although not long enough effective to reduce practice to a steady state, has yet brought forcible lessons which in the long run will be turned to good account. In particular, it has compelled attention to the problem of burning poor fuel at its best efficiency. In our current issue T. A. Marsh describes the practical methods of dealing with a typical coal of peculiarly mean characteristics, the very low-grade bituminous product common in Iowa and some other sections of the Western country. It is, in the first place, of low heating value, somewhere about 9000 B.t.u. (1030 calories), and, second, it carries from 15 to 30 per cent of ash. What is worse, this ash is very fusible. In fact, some of the coal burns so badly that in regular working under boilers it has hardly more than 40 per cent of the evaporative value of a really first-class bituminous coal. Difficult enough to handle successfully by careful hand firing, it has made all kinds of trouble with mechanical stokers highly successful with ordinary fuel. Nevertheless, it is capable of being used with very fair economic results.

Mr. Marsh tackles the problem in its rigorously practical aspects. The first condition to be faced is that by reason of the low heating value of the coal more must be consumed for a given duty, and hence abnormally large grate area must be provided, which frequently implies a considerable change in the boiler settings. Given a big surface of chain grate, there must also be large arch capacity, since from its great ash content and other peculiarities the fuel burns with difficulty and the temperature of the fuel bed must be kept up. Above all, there should be a continuous free discharge of ash, which may well constitute a quarter the weight of the coal. Given these conditions and a fairly good draft, things go along tolerably well. Combustion rates between 30 lb. and 40 lb. per square foot (15 kg. and 20 kg. per sq.m.) per hour have been obtained even with coal of the relatively poorer grades, says Mr. Marsh. Of course, not all Iowa coal is by any means so bad as this would suggest. The better sorts may run consistently above 10,000 B.t.u. per pound (1140 calories per kilogram), and these will work very much like other moderately good bituminous coals and can be handled in more nearly the usual manner.

The big question is what to do with a very considerable supply of poor fuel, somewhat disadvantageous to transport, of low thermal value and troublesome to burn. As time goes on and fuel prices rise even above their present heights, the necessity of utilizing the lower and locally cheaper grades becomes steadily more pressing. The costs of labor and transportation have worked upward on a sort of ratchet which there is small prospect of disengaging, and in the future every effort must be made to hold down final expense by making the most of engineering skill and well-planned machinery. We have long been hammering away at the possibilities of saving at the furnace, and while probably for some time to come the best economic results will be obtained with medium rather than low-grade coal, no opportunity should be lost to study the situation, work out improvements in furnaces and firing and by increasing efficiency make ready for emergencies that are likely to arise. To this end such discussions as that by Mr. Marsh have a very direct value, and they should receive thorough consideration for future if not for present use.

*The laborer is worthy of his hire. Samuel Gompers knows it, and so do capitalists like Charles M. Schwab and John D. Rockefeller, Jr. In the abstract the proposition is perfectly clear and accepted by all. The trouble lies in its application. Many a good resolution has been brought to naught through faulty interpretation, and the attitude of labor and of capital has suffered grievously in this respect. When each understands the other both prosper.*

## Auxiliary Energy Cost a Liability

THE allocation of operating costs and fixed charges to different classes of service has long engaged the attention of rate makers. It is equally important that the total service furnished shall carry the combined charges and expenses involved in providing it. Thus, in a hydroelectric supply system, the rates should not only bear the total burden of fixed charges and running costs on the water and transmission sides of the property, but wherever steam auxiliary service is required or held in readiness at the company's expense.

This point has been emphasized in a decision of the Massachusetts Gas and Electric Light Commission upon the equity of the rates established in a contract between the town of Westfield and the Turners Falls Power & Electric Company. In passing upon the reasonableness of a coal clause, and recognizing that there is no "standard cost" of water power, the commission points out that every unit of hydroelectric energy has to carry the cost of the auxiliary plant which takes the burden when the water power fails, and that although the extent of steam auxiliary service is almost impossible to predict this cost is none the less real.

Such an emphasis by the commission upon an economic relationship which has been none too generally realized by the public is of much value. The popular fallacy that water power costs practically nothing because Nature works while we sleep, so to speak, dies hard. Exery expression by the public authorities making it clear that all the elements of service cost, including capital, labor and material charges, must be included in the final rate structure helps to bring about

constructive popular thinking and a more confident treatment of rate problems by the companies themselves.

*No sensible person imagines that the war-time conditions under which electric utilities labored so patriotically can long continue to prevail. Fatigue is not necessarily restricted to human beings; machinery succumbs to overwork as well. However, operators have learned greater respect for the sustained performance of their generating equipment.*

## Charging for the Power Factor

WE HAVE considered in recent numbers the physical problems that are involved in operating loads at low power factor and some of the practical remedies applicable to the situation. In the current issue we bring squarely to the front in another of Will Brown's valuable papers the much vexed question of penalizing those who are at fault. A station manager can do much by proper supervision of motors put upon his lines, by frequent inspection and by moral suasion. But when the remedy costs good money, as it usually does, something more convincing than general logic is often necessary. Already many companies have inserted power-factor clauses in their contracts, generally not enforced and perhaps intended to be enforced only as a last resort. The loads, however, have piled up of late to an extent that has caused real difficulties in operation, and since, generally speaking, the limit of output is determined by the heating of the generators and the distribution losses rather than by lack of capacity for driving the machine, the burden imposed by poor power factor becomes immediately serious.

Various companies, as noted by Mr. Brown, have developed differing schemes for penalizing low power factor. Ordinarily they involve a certain nominal power factor taken as standard and a correction based on the kva. in reckoning either the maximum demand or the metered consumption. The resulting rates look rather intricate, which is always a disadvantage in dealing with the public, and they also involve some considerable trouble in measurement. As in every case of rate making, they evaluate more or less exactly certain factors of the service and take the rest by general average. In the case before us the essential point is that the customer who operates at unity power factor puts, other things being equal, the minimum burden upon the whole equipment from stoker to motor switch and secures to it the maximum efficiency of operation in providing his output. At reduced power factor the trouble and expense he puts it to is in no minor degree some function of the kva. he demands, and it is therefore at least an open question whether the item measured and charged for should not be the kva. furnished, a scale of rates then being based upon average power-factor conditions.

Such a system would cover the circumstances in much the same general way as any other and would be both simple and effective. It would essentially be based on unity power factor with a rate scale determined by average departures from this ideal condition. Of course, where a well-ordered demand system is in use the demand should always be based on kva., but lower power factor does produce an effect on cost of supply as well, which should in some way be included. One thing is certain that any sound system of rates should penalize the customer who makes abnormal demands for kva. The chief consideration practically is that there ought to be some general basis of action on the part of the supply companies. This is a matter that could very properly be taken up by the National Electric Light Association with a view to obtaining concerted effort for reform.

*At the annual conference of state governors in Baltimore this week public utility corporations were reminded of the fact that they can exist only when they recognize that their existence is permitted for service and not for self and that they are servants and not masters. To this declaration electric utilities have no hesitancy in saying, Amen!*

## A Speculation on Government by Formula

THE wonderful old man who was the real head of the French Republic in the long-drawn-out crisis that just preceded victory was in early life a practicing physician. The real head of the British nation was originally a lawyer. Here in the United States, where the real and the titular head are one, the President was in private life an educator. In our legislative bodies and in those of other nations alike lawyers, physicians, manufacturers, merchants, farmers, journalists and mechanics abound and have abounded, but hardly ever is there seen an engineer. Yet surely the engineering mind, with its vision and its certainty, its orderly processes and its logical conclusions, would be a political adjunct of no mean value.

It is a curious speculation how far the mathematical formulas of the engineer could be translated into terms of political economy and social science. Government by formula is, to be sure, no new thing. It has been tried by many an autocrat with the textbooks of Machiavelli and his disciples as guide; but the autocrats have always forgotten the fundamental postulate that Emerson memorably expressed when he said that God would "take the sun out of the sky ere freedom out of man." It was tried, too, by the leaders of the French Revolution, and doubtless is being tried by the Russian soviets to-day. But revolutionists are not engineers; too often they are mere sophists, sciolists and rhetoricians. The two sides of their equations are not equal, and of necessity the solutions are grotesque.

The engineering mind is different. With exceptions so few as to be negligible, bridges stand and bear their traffic, power houses produce the estimated energy, dams hold back the impounded waters, foundations sustain the predetermined weight. The science of engineering has transformed physical life. The science of politics seems sometimes to have stood still since the days when a Coriolanus could insult and an Antony cajole the people. Yet democracy is a fact, not a figment as in Roman days, and those who deal with it are part of it. Their theories have been legion. It would be interesting to see what variations the engineering mind would produce were it to turn from formulas for tunneling mountains and erecting transmission lines to formulas for harmonizing clashing human interests and interpreting the psychology of the mass.

# Power-Factor Clauses in Contracts

## Commercial Problems Involved—Opinions from Widely Scattered Central Stations Regarding Necessity of Considering Power Factor—Typical Clauses of Two Types of Contract Which Base Charges on Average Power Factor

BY WILL BROWN
Electric Machinery Company

THE great attention which is now being paid to power factor by central-station operating companies is due to the conditions recently brought about by the war. Formerly power systems were built on a larger scale than the market at the time required, consequently their problem was to build up a load for their generators. At the present time, however, the demand for power has outrun the supply, and the acute conditions caused by low power factor have come on in some cases very rapidly.

Power-factor regulations are by no means a new thing. They have been carried in contracts by different companies throughout this country and Canada for several years, but very seldom indeed have they been rigidly enforced. Questions involved so much explanation to the power customer and the whole thing was so complicated from the standpoint of accurate metering that the clauses soon became "dead letters." They did, however, serve the purpose of a club in the hands of the power company to enforce reasonable power factor from the customer. It seems to be the opinion of many central-station men that power-factor penalty clauses can only be used in this way, and that there can be no accurate method of grading rates according to power factor maintained.

Opposed to this view are many prominent central-station managers in this country and Canada, who claim they have proved by experience that they can accurately measure the average power factor of a customer's load and charge on this basis. They claim that the matter of power factor, although a very different thing from load factor, is just as important in basing alternating-current rates.

The case resolves itself to this: There are power consumers who do maintain good power factor. There are consumers who do not maintain good power factor, but who will make a reasonable effort to better their conditions if proper inducements are made. There is a third class of consumers who either by choice or necessity will not make an effort to better power-factor conditions. Is it fair for the central station to make the good customer carry the burden imposed by the bad customer?

### OPINIONS FROM MANY SOURCES

Various opinions have been expressed on this subject, some of which are given here. The following is an extract from a recent report of the Canadian committee on rate research, prepared in view of the shortage of power and the high cost of machinery to carry increased demands:

Whereas in the past power-factor clauses have not been vigorously applied, nowadays nearly all companies are requiring the customers to keep their power factor within reasonable limits at all times and to pay for any deficiencies. The question of the measurement of power factor as to whether same should be computed to the time of maximum load of the consumer's installation or to the time of maximum load of the company's system, or whether the average power factor taken by the customer of the whole period of his operation should be taken as the determining factor, is not yet standardized.

The committee of the Canadian Electrical Association on commercial light and power sales says:

The power shortage has called to the attention of the companies suffering from it the necessity of being much more careful in their sales of power and the conditions of sale, among which perhaps the most important is the regulating of power factor. In the past, owing to loose power-factor conditions and non-enforcement thereof, power lines have become encumbered with motors of excess capacity or of improper voltage, or improperly repaired, with the result that many companies were supplying motor loads at a very low power factor, materially decreasing their line capacity, their generating station capacity and transformer capacity, all of which is so urgently needed at the present time.

Most companies throughout the country are now strictly enforcing their power-factor regulation clauses, or writing in new power-factor clauses in their new contracts, with the result that the users of power, owing to penalties imposed for poor power factor, are readjusting their equipment to operate at a proper and reasonable power factor, which has worked very much to the benefit both of the central station and of the consumer.

The Southern Wisconsin Power Company specifies that where the power factor is below 90 per cent it will add to the number of actual kilowatt-hours an amount sufficient to make the total kilowatt-hours equal to 90 per cent of the total of the apparent kilowatt-hours.

This is an interesting clause because of the fact that it actually charges on the basis of kilowatt-hours at a specified power factor. Nearly all of the power-factor clauses relate to the maximum demand charge entirely and ignore the energy charge.

### TYPICAL POWER-FACTOR CLAUSES

The following are some typical clauses from power contracts:

*Cleveland (Ohio) Electric Illuminating Company.*—When the current supply is alternating and the greater part of the load is power and the billing demand exceeds 75 kw., the company reserves the right to test the power factor of the consumer's load, and if the average power factor is greater than 75 per cent, then the demand shall be reduced in accordance with the following formula: Billing demand = kilowatt demand as measured ÷ average per cent power factor × 75.

If the average power factor is less than 60 per cent, then the demand shall be increased in accordance with the following formula: Billing demand = kilowatt demand as measured ÷ average per cent power factor × 60.

The company will make without charge a power-factor test at the consumer's request once a year, if his demand exceeds 75 kw. By power factor is meant the average power factor under normal operating conditions.

*Niagara, Lockport & Ontario Power Company.*—The purchaser shall at all times take and use the three-phase power in such manner that the power factor will be as

near 100 per cent as possible, but whenever at any tim the current is not taken at 100 per cent power factor and the power factor is less than 90 per cent, then the basis of charge for that day, in lieu of the highest one-minute demand, shall, if the power company so elect, be considered as 90 per cent of the maximum kva. taken for a period of one minute divided by 0.746. This amount shall never be considered as less than the fixed horsepower agreed to be purchased and paid for.

*Northern Indiana Gas & Electric Company.*—The primary charges will be increased by 1 per cent for each 1 per cent the power factor on the entire load decreases below 75 per cent at any time. If the power factor on the entire load, owing to lagging current, is maintained at 95 per cent or better, a discount of $1 per kilowatt per year will be made from the primary charges.

*Harrisburg (Pa.) Light & Power Company.*—The consumer shall at all times take and use power in such manner that the power factor shall be as near 100 per cent as possible, but when the actual power factor is less than 80 per cent, then the demand to be charged and paid for shall be obtained by multiplying the demand shown by the meter at the time of measurement by 80 and dividing the product thus obtained by the actual power factor.

*Milwaukee (Wis.) Electric Railway & Light Company.*—The customer agrees that when possible the average power factor of the equipment to be supplied with electric energy hereunder shall not be less than 80 per cent. Should the power factor of the electric current taken by the customer at any time be less than 80 per cent, then the maximum demand as specified herein shall be ascertained and determined as 0.00080 of the product of the maximum average amperes taken by the customer for fifteen consecutive minutes multiplied by the volts and the factor 1.73.

*Duquesne (Pittsburgh) Light Company.*—Where the power factor of the customer's load is below the subjoined schedule of permissible power factors the company reserves the right to increase the demand as estimated or measured in the ratio that the actual power factor as determined by test bears to the permissible power factor:

| | | | |
|---|---|---|---|
| 75 per cent power factor for demands from | 10 kw. | to | 50 kw. |
| 80 per cent power factor for demands from | 50 kw. | to | 250 kw. |
| 85 per cent power factor for demands from | 250 kw. | to | 1000 kw. |
| 90 per cent power factor for demands above | 1000 kw. | | |

*Companies Controlled by the United Gas Improvement Company (Philadelphia).*—The primary or demand rate for any month shall be increased 1 per cent for each 1 per cent the lagging power factor on the consumer's load is at any time during such month below the following: 75 per cent at the time of maximum demand, 70 per cent at the time of 75 per cent of maximum demand, 65 per cent at the time of all other demands.

If the lagging power factor on the consumer's load is maintained at all times during the month at 95 per cent or better, 10 cents per kilowatt per month of demand will be deducted from the primary or demand charge.

*Philadelphia (Pa.) Electric Company.*—We penalize a customer for a power factor below 80 per cent, correcting the stand-by charge to 80 per cent basis.

*Toledo (Ohio) Railways & Light Company.*—The maximum billing demand shall be determined from actual measurements of the customer's demand and a consideration of the power factor at which these measurements are taken and shall be calculated by multiplying the greatest integrated fifteen-minute demand by 80 per cent divided by the actual power factor at which the demand measurements are taken.

## Basing Charge on Average Power Factor

In all of the above contracts the maximum-demand charge only is involved. In Canada, however, central stations have actually been basing their energy charge upon the average power factor of the load. The following clauses are examples of Canadian practice:

*Montreal Light, Heat & Power Company.*—The minimum power factor of the electrical energy taken shall not be less than the following:

Motors and apparatus of 3 hp. rated capacity and less, 70 per cent; over 3 hp. and not exceeding 5 hp., 75 per cent; over 5 hp. and not exceeding 10 hp., 80 per cent; over 10 hp., 85 per cent.

If the power factor of the electrica. energy taken is found to be less than as specified above, then consumer shall pay for the electrical energy taken on the basis of the minimum power factor so specified.

*Southern Canada Power Company, Ltd.*—If the power factor of the electrical energy taken is found to be less than 85 per cent, then consumer shall pay for the electrical energy taken on the basis of 85 per cent power factor.

*Toronto Power Company.*—The purchaser agrees to use the three-phase electrical energy in such a manner that the current values, as determined by suitable current indicating or recording devices, for the three phases shall be balanced each with the others to such an extent that the difference between the lowest and the highest coincident current values shall not be greater than 5 per cent of the lowest current value; and that whenever a current unbalance providing a difference in excess of 5 per cent shall occur in the manner hereinbefore stated, then the amount of power may at the option of the power company be taken as 90 per cent of 1.73 times 95 per cent of the highest of the three current values multiplied by the highest phase voltage coincident with the current value used.

The current and voltage are to be determined by commercial instruments meeting the requirements of the Department of Inland Revenue for Canada.

The purchaser agrees to use the three-phase electrical energy in such a manner that the power factor shall be 90 per cent, and that whenever the said power factor shall be less than 90 per cent, then the power company may take 90 per cent of the kva. as the rate of taking power and use the same in determining the demand rate or the energy consumption.

## Fundamental Difference Between the Two Clauses

The basic difference between these two types of clauses should be carefully noted. In one case the maximum demand as metered at infrequent intervals varying from once a month to once a year is increased according to the amount of power-factor drop below a certain specified minimum. In the second case every kilowatt-hour of energy as metered by the watt-hour meters is increased in proportion to the amount of power-factor drop below a specified minimum. It is plain that while the former method could be enforced with a fair degree of accuracy, it would not in any way take into account the average power factor of the customer's load.

It may be argued that the central station is only interested in knowing the customer's power factor at full load because at periods of light load the system could be operated at lagging power factor without great inconvenience. But it does not always follow that the periods of light load of the consumer coincide with periods of light load on the system. They may occur at the time when the system load is at the peak. On the other hand, it is possible that the consumer's average power factor might be better than his power-factor test showed at the peak. It would seem, then, that an energy charge based upon the average power factor of the consumer's load would be the preferable method. Why has it not been more widely adopted? The reason is that it has been almost impossible to meter power factor of a load in proper time relation to the energy consumed. This subject will be taken up in the next and final article of this series, which will appear in an early issue of the ELECTRICAL WORLD.

# Reducing Difficulties in Burning Iowa Coal

## General Considerations to Observe in Selecting Stokers and in Designing Furnaces—Specific Changes Which Can Be Made in Order to Adapt Existing Stokers to Lower-Grade Fuels

BY T. A. MARSH
Chief Engineer Green Engineering Company

SINCE the zoning of coal went into effect many central stations in the low-grade fuel districts have had practically to shut down because the stokers were unable to burn the coal available. To assist companies which are facing this predicament as well as those which would preferably burn a poorer quality of fuel if they knew how, in order to save the freight

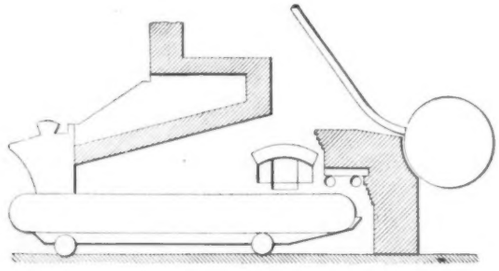

FIG. 1—CHAIN GRATES UNDER STIRLING BOILER WITH LONG ARCH AND FORWARD CORBELED BRIDGE WALL

on a better grade, the writer will consider Iowa coals and point out what conditions are essential to their effective combustion. In doing this attention will be called to general considerations to observe in selecting new stokers or building new furnaces as well as in modifying existing equipment to meet different operating conditions. Methods employed to burn efficiently and at good rates of combustion Iowa coals even of the lowest grades containing 7000 B.t.u. to 9000 B.t.u. will be described.

The coals of Iowa are most difficult to burn. They are bituminous and non-coking and contain a very high percentage of low fusible ash. Typical analyses of screenings are tabulated below:

| | Good | Fair | Poor |
|---|---|---|---|
| Moisture (per cent) | 7.83 | 12.36 | 14.42 |
| Volatile matter (per cent) | 38.83 | 37.65 | 29.29 |
| Fixed carbon (per cent) | 34.42 | 31.94 | 30.00 |
| Ash (per cent) | 16.23 | 18.06 | 26.29 |
| B.t.u. (commercial) | 10,476 | 9,712 | 7,118 |
| B.t.u. (dry basis) | 11,774 | 11,081 | 8,316 |
| Sulphur (per cent) | 4.75 | 5.75 | 7.0 |

The better grades of Iowa coals are about on a par with the poorest grades of Illinois and Indiana coal. The percentage of ash is high, and it is fusible at a low temperature, so that clinker is easily produced. Fair grades of Iowa coal contain 18 per cent of ash and 9700 B.t.u. Such coals are inferior to the poorer grades of Illinois and Indiana coal. This coal is difficult to ignite in any furnace and produces large quantities of clinker, most sticky when hot and and vitreous when cold.

The poorer grades of Iowa screenings contain approximately 7000 B.t.u. and 7500 B.t.u. and 25 per cent to 30 per cent of ash. Such coals are most difficult to burn and difficult to handle in furnaces, owing to the large amount of clinker which must be removed. The refuse amounts to about 25 per cent by weight of the coal fired.

The plant owner who figures on using Iowa screenings to contain more than 9500 B.t.u (commercial basis) is likely to be disappointed. If he has not made provision for the use of such coals and for coals having more than 25 per cent of ash and clinker, he will probably resort to the use of more expensive coals, imported from Illinois or Indiana, and thereby suffer a loss due to higher steam costs.

These coals cannot be burned unless great care has been exercised in the selection of stokers and design of the furnace. The better grades can be used on hand-fired grates with frequent cleaning and can be burned with some types of stokers, but the lower grades have caused failures of more types of stokers than perhaps any other coals, because of inability of such stokers to provide proper treatment of the fuel in the furnace.

### SELECTION OF STOKERS

It is evident from a study of the analysis of Iowa screenings that the type of stoker used must have liberal facilities for ash removal. Stokers that have not are limited to better (frequently washed) grades of Iowa coal containing 9500 B.t.u. or more, which in Iowa is a selected coal. Aside from its enormous quantity of ash, calling for practically continuous ash removal, the coal is difficult to burn because its ash has a low fusibility point and a clinkering tendency that make it imperative, for successful combustion, that the fuel bed be unagitated. These characteristics of continuous ash discharge from the furnace and undisturbed fuel are best exemplified by the chain grate.

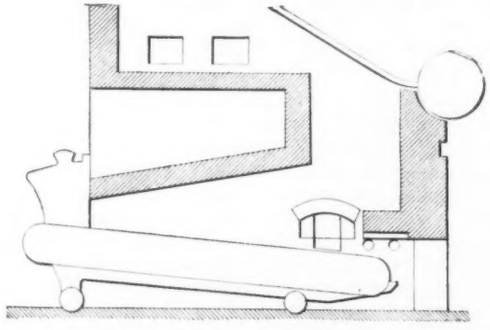

FIG. 2—CHAIN GRATE UNDER BADENHAUSEN BOILER WHICH IS SET HIGH TO GIVE MORE FURNACE SPACE

Whereas 3 lb. (1.3 kg.) of West Virginia coal will produce about a horsepower, 7.5 lb. (3.4 kg.) of some Iowa coals is required (a ratio of 250 per cent) to produce the same power. Therefore, if the same combustion rate is to be maintained in both cases, the grate area for Iowa coal should be 250 per cent of that required

for West Virginia coal. Stokers of extreme width and length must be furnished in order to provide the maximum grate area.

Obviously, no rule of thumb or standard table of chimney or flue areas based on horsepower developed will serve to determine the necessary areas for gases

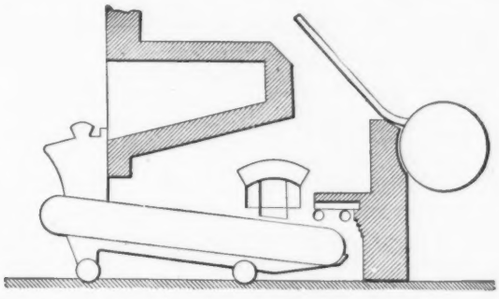

FIG. 3—ARCH WITH OFFSET FRONT TO SEAL OFF AIR

from these coals. The analysis must be based on fuel to be burned, allowing a liberal excess of air as required by such fuels.

### FURNACES REQUIRED

Iowa coals require an extreme amount of reflecting brickwork and arch to produce combustion temperatures. With chain grates it is customary to provide arches from 8 ft. to 10 ft. (2.4 m. to 3 m.) long augmented by bridge walls with vertical reflecting faces or with faces sloping forward to reflect the heat forward and down on the fuel bed. So large is the volume of ash from the average Iowa coal that an opening of 5 in. (12.7 cm.) must be left between the grate and waterback for the discharge of ash. This constant stream of ash 5 in. deep the full width of the stoker, which travels at the rate of from 2 in. to 8 in. (5 cm. to 20 cm.) per minute, gives some indication of the ash produced and explains why continuous discharge is advisable and why intermittent cleaning may produce undesirable results.

A setting of chain grates with Stirling boilers, which is typical of installations burning Iowa coal is shown in Fig. 1. Attention is called to the length of arch and the forward corbeling of the bridge wall. This furnace has burned coal of the following analysis at rates of 36 lb. per sq.ft. (175 kg. per sq.m.) of grate surface hourly:

| | |
|---|---|
| Moisture, per cent | 14.05 |
| Volatile matter, per cent | 31.92 |
| Fixed carbon, per cent | 28.82 |
| Ash, per cent | 25.21 |
| B.t.u. (commercial) | 7,900 |
| B.t.u. (dry basis) | 9,192 |

The same setting has burned over 30 lb. per sq.ft. (146 kg. per sq.m.) of grate surface per hour of coal of following analysis:

| | |
|---|---|
| Moisture, per cent | 11.65 |
| Volatile matter, per cent | 29.00 |
| Fixed carbon, per cent | 26.75 |
| Ash, per cent | 32.60 |
| B.t.u. (commercial) | 7,100 |
| B.t.u. (dry basis) | 8,085 |

A similar furnace applied to a Badenhausen boiler is shown in Fig. 2. The boiler is set higher, giving more furnace space, which increases the furnace efficiency. Fig. 3 shows the application of an arch with the front offset to seal off air, a very desirable adjunct for use with Iowa coals. Fig. 4 shows a furnace of extreme design with a reversed arch to reflect the heat and gases forward. This furnace was developed to burn coals running as low as the following analysis, which approaches the low limit of quality of coal being successfully burned on stokers to-day:

| | |
|---|---|
| Moisture, per cent | 19.03 |
| Volatile matter, per cent | 25.02 |
| Fixed carbon, per cent | 22.23 |
| Ash, per cent | 33.72 |
| B.t.u. (commercial) | 5,315 |
| t.u. (dry basis) | 6,576 |

### REVISION OF EXISTING FURNACES

Few existing furnaces have either sufficient arch effect or sufficient furnace volume, and most of them permit great improvement, especially when they are to be used with Iowa coal. The improvement must usually be of a radical nature, generally starting with an increase in grate area. Long arches must be supplied. With low-set, vertically baffled boilers this sometimes results in a change to some type of horizontal baffling in order to obtain suitable furnaces. Each furnace presents an individual problem, but analyses by competent combustion engineers usually permit marked improvement.

With chain grates, fuel beds of from 5 in. to 8 in. (12.7 cm. to 20 cm.) are carried at speeds of from 2 in. to 8 in. (5 cm. to 20 cm.) per minute. These items depend on the ratings desired, the size of fuel and the draft. Iowa coal, being very inert and having its ash so intimately a part of the coal structure, requires liberal draft. It is well to provide for 0.40 in. to 0.50 in. (10 mm. to 12.5 mm.) in the furnace.

Another characteristic of Iowa coal which is common to many low-grade fuels is that wetting the fuel improves the combustion appreciably. It is not to be understood that the addition of water helps combustion from a chemical standpoint, but it certainly does from a physical standpoint. The water should be added at least two hours before firing so as to be thoroughly absorbed in the fuel. The physical action is threefold: First, the sifting of coal through the grate is diminished; second, the fuel bed is made more compact; third, the steam generated by the moisture in the coal cracks open the pieces of coal, presenting new clean surfaces

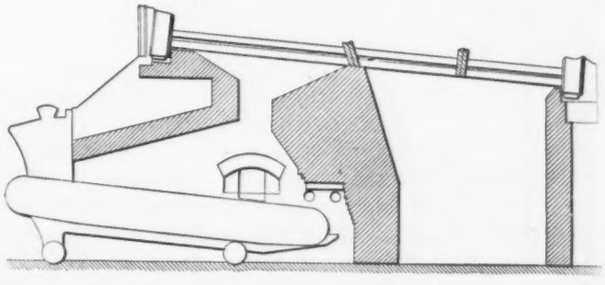

FIG. 4—REVERSED ARCH TO REFLECT HEAT AND GASES FORWARD

for quick combustion. These advantages more than offset the detrimental effect of excess moisture, which, of course, must be evaporated and superheated up to the temperature of the escaping gases from the boiler.

From the foregoing discussion of Iowa coals the following conclusions are evident:

(1) The coals of Iowa are extremely high in ash, clinker easily and contain from 7000 B.t.u. to 10,000 B.t.u. Iowa coals containing above 9000 B.t.u. (commercial basis) may be called selected coals.

(2) With coals having one-fourth of their weight in ash the ash discharge should be continuous and liberally proportioned. Chain grates are burning these coals successfully.

(3) Large grate areas are necessary, as also are high draft and long arches. None of these items of design is likely to be overdone. Chimney and flue areas must be liberally designed, based on high coal per horsepower.

(4) Existing settings can be improved to handle these coals. Revisions usually must be radical, such as larger grate area, longer arches and larger furnaces.

While the foregoing article is written specifically regarding Iowa coals, the same principles apply to any high-ash, low-heating-value, non-coking coals such as those mined in Texas and Nebraska.

## SELECTION OF MOTORS FOR CEMENT INDUSTRY

### Types of Apparatus Best Suited to Conditions—Starting and Running Power Requirements—Methods of Applying Motors to Machines

THE paper by R. B. Williamson on the "Selection of Electric Motors in the Cement Industry," presented before the A. I. E. E. in New York recently, is an admirable example of the way in which industrial applications ought to be discussed. After explaining briefly the processes involved in the manufacture of cement, the writer pointed out the general conditions under which the motors must operate. Then the starting and running power requirements are discussed and the motors having characteristics suitable for the service are named. Recommended methods of applying the motors to various machines are cited. All through the discussion reasons are given for the statements made. Not much has been said regarding control and protective equipment, but this is probably due to the fact that only simple control in the form of a knife switch or compensator is required in most cases.

Mr. Williamson pointed out that alternating-current motors are used more extensively than direct-current motors in this service on account of the relatively higher alternating voltages that can be used and the greater mechanical simplicity of the alternating-current motors, particularly those of the squirrel-cage type. In general, the service is continuous and the starting conditions are particularly severe, often making the use of wound-rotor motors necessary. Particular attention must be given to the protection of brushes, commutators and collector rings from the cement-mill dust. Bearings also must be protected from this abrasive action. Low-speed or moderate-speed motors are usually preferred on account of the slower speed reduction necessary and the fact that these motors are mechanically more substantial. For motors of 75 hp. or larger outboard bearings are commonly required. Regarding elevator and conveyor motors, the starting torque is likely to be above normal running torque, but standard squirrel-cage motors, if large enough to take care of the peak loads, as mentioned above, should have no difficulty in starting them. Screw conveyors occasionally wear their bearings down so far that the screw may rub against the trough for most of its length with consequent overload. These possibilities make it advisable in the case of individual drive always to install motors from 25 to 50 per cent larger than necessary to meet the average power demand. This is not true when the group drive is used as it is very unlikely that more than one unit of the group would be subjected to overload at the same time, and this would probably not affect the operation of the motor to any extent. Dimensional data and motor requirements are given for a number of installations. Crushing, grinding and drying machines are taken up in the same manner, data on power and torque requirements being given, and the particular motor best fitted for the service is recommended in each case. Tables giving power required for gyratory and rotary crushers are reproduced herewith.

TABLE I.—POWER REQUIREMENTS OF GYRATORY CRUSHERS

| Maker's No. | Size of Opening on Each Side of Tap Bearing Arms | Size Cube Which Can Be Crushed | Horsepower |
|---|---|---|---|
| 3 | 7 × 28 | 7 | 10- 20 |
| 4 | 8 × 34 | 8 | 15- 25 |
| 5 | 10 × 40 | 10 | 20- 35 |
| 6 | 12 × 44 | 12 | 25- 40 |
| 7½ | 15 × 55 | 15 | 50- 70 |
| 8 | 18 × 68 | 18 | 65-100 |
| 9 | 21 × 76 | 21 | 100-140 |
| 10 | 24 × 99 | 24 | 125-175 |
| 18 | ..... | 36 | 150-200 |
| 21 | ..... | 42 | 150-200 |
| 24 | ..... | 48 | 175-225 |
| 27 | ..... | 54 | 200-250 |

In the discussion following the paper President C. A. Adams said that it had been the experience in studies of this sort that processes may be greatly improved by the application of electricity and that the ease of measuring power taken by electric motors makes such investigations particularly feasible. A. M. Dudley, for the committee on industrial and domestic power, explained that this was the first paper brought out by the committee which has undertaken a study of motor requirements for machine-tool installations for cement mills and for elevator service, these industries having been selected as typical. Lynn Bradley told of a method of collecting potash as a by-product in the cement industry, and Prof. W. I. Schlichter pointed out that electric drive is so well established that authors no longer offer apologies or reasons for its application in the industry. Mr. Williamson, in conclusion, pointed out the fact that the synchronous motor may be very useful in the cement industry (for not much starting and stopping is required) by reason of its large air gap and high power factor.

TABLE II.—POWER REQUIREMENTS OF ROTARY CRUSHERS

| Machine Size | Approximate Capacity in Tons per Hour | R.P.M. | Approximate Hp. |
|---|---|---|---|
| 00 | 1 to 1½ | 300 | 1 to 2 |
| 0 | ½ to 2 | 250 | 3 to 4 |
| 1 | 1 to 6 | 300 | 6 to 10 |
| 1½ | 4 to 10 | 200 | 15 |
| 2 | 8 to 15 | 250 | 15 to 20 |

# ELECTRICAL PRECIPITATION OF METALS IN WASTE GASES

## By Using Cottrell Method to Remove Copper, Zinc, Etc., from Flue Gases Company Expects Saving That Will Buy Treating Equipment

IN REFINERIES there is always a chance of valuable by-products escaping in the waste gases that go up the flues. This is very true in the metal treating field. At a copper-refining plant in the East it has been found possible to remove 90 per cent of the solid and liquid particles from the flue gases by an electrical process and that the value of the copper, zinc, etc., recovered in a short time will be sufficient to pay for the treating equipment. The process involves passing the gases through tubes in which are suspended chains charged with high-voltage direct-current power. The particles carried by the gases become electrified and are projected against the walls to the tubes. These tubes are grounded and thus the particles drop into hoppers below. It has been calculated that 0.5 amp. is required in the high-tension direct-current circuit at full load.

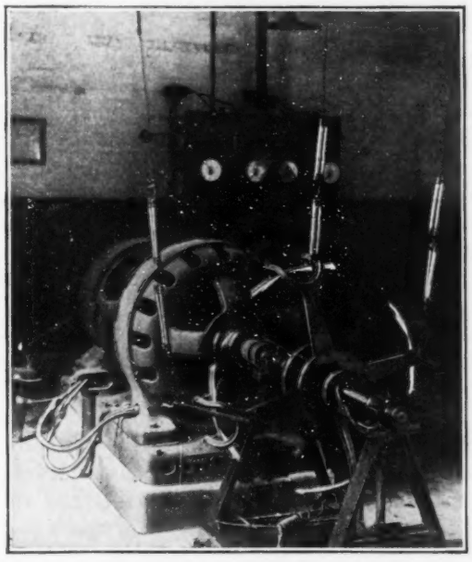

FIG. 1—RECTIFIER DRIVEN BY SHAFT OF GENERATOR ENERGIZING TRANSFORMER

In plants of this type the electrical equipment is generally split up into a number of small units. However, in this case all the current is handled by a single generator and transformer. A duplicate set has been installed for emergency purposes. With this arrangement there is a sacrifice in flexibility of operation, but the use of large units makes the installation more compact.

The tubes containing the high-tension electrodes and through which the flue gases pass are arranged in six groups. The electrodes are suspended from a rack which provides ample insulation and are connected with the high-tension direct-current line at the bottom. Disconnecting switches permit cutting off any group to permit inspection and repairs. The gases can be made to go through the treater or directly to the stack.

The generating equipment includes two 40-kva., 60-cycle, single-phase motor-generators that deliver energy at 150 volts to 250 volts to 200/100,000-volt transformers. Taps are provided from which voltages of 50, 62½, 75 and 87½ per cent of the maximum voltage can be obtained, the full transformer rating being available on each tap. The high-tension leads pass out of the transformers through condenser-type bushings. Choke coils are provided inside the transformers to smooth

FIG. 2—ELECTRODES SUSPENDED IN PRECIPITATOR TUBES

out the static surges that are liable to occur in the high-tension circuit. To the motor-generator shafts are coupled mechanical rectifiers that transform the high-tension alternating current into direct current.

The voltage of the high-tension direct current must be varied according to the condition of the flue gases being treated. The large variations can be made by changing the transformer taps, while the small adjustments are obtained by regulating the generator. In addition, a bank of adjustable resistance is connected in series with the low-voltage alternating-current circuit to serve as ballast and permit further adjustment of the voltage. Resistance is also provided in series with the high-tension direct-current circuit in the form of tubes mounted above the rectifiers.

Under ordinary operating conditions, the motor-generators are employed to supply all energy used in the treating apparatus, but in emergencies current from the alternating-current lines can be fed into the transformers. Under such circumstances the rectifiers driven

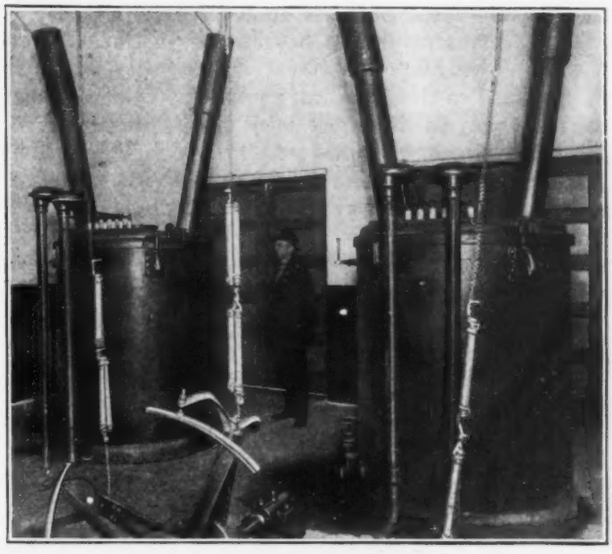

FIG. 3—100,000-VOLT TRANSFORMERS AND PORTION OF RECTIFIER IN FOREGROUND

by the generators cannot be used. In their place are employed auxiliary rectifiers driven by synchronous motors which keep the rectifiers in synchronism with the current being rectified. The generating, transforming, rectifying and control apparatus is Westinghouse.

# Economic Position of the Jobber

## Electrical Supply Jobbers' Association Plans to Conduct Organized Advertising and Publicity Campaign in Interest of Its Members, Pointing Out Economic Value of Jobber's Service to the Industry

This article gives substantially the features of the report adopted at the meeting of the Electrical Supply Jobbers' Association in Cleveland last week. The real strength of the electrical jobbing branch of the industry is indicated by the statement that it carries stocks of $40,000,000 and does an annual business of over $300,000,000.

ON JUNE 14 the following committee was appointed by the secretary: F. R. Elliott, Elliott-Lewis Electrical Company, Philadelphia; A. M. Little, chairman, Mohawk Electrical Supply Company, Syracuse, N. Y., and E. D. Van Winkle, Post-Glover Electric Company, Cincinnati.

### NECESSITY OF AN ORGANIZED ADVERTISING AND PUBLICITY CAMPAIGN

A glance at the electrical trade journals shows that practically every unit of the electrical trade is advertised more or less systematically, excepting the jobber, and the small number of jobbers advertising simply accentuates this statement.

Manufacturers can afford to advertise in trade journals and make the widest use of this publicity. Contractor-dealers are brought definitely to the attention of the trade through their own journal and latterly through the influence of the Goodwin movement.

The jobber, notwithstanding that he occupies a position between the above two classes of trade and is directly affected by the same things that affect them, is not in evidence as an organization, excepting in the case of the above-mentioned small number of jobbers who do any advertising of the above kind.

If the manufacturer is benefited by national advertising both in trade and other journals, the jobber can be benefited in the same way; yet no individual jobber can advertise in the above mediums, because he does a local business. Granting the above, if the manufacturer benefits by advertising his particular product, there is every reason why the Electrical Supply Jobbers' Association can benefit by advertising its particular product, which is the service that its members have rendered and are prepared to render.

Throughout the electrical contracting trade there has been and is now a disposition to buy from the jobber only as a last resort. Throughout the manufacturing trade there is an element of uncertainty as to whether its products should be marketed direct to the consumer, through the contractor-dealer, through the jobber or through both of them. This attitude of mind on the part of buyers was one of the first things reflected in government work when men from civil life became active in government purchasing, and as a result great stress was laid by them, and naturally by those under them, on eliminating the jobber or middleman in all classes of trade so far as possible. Notwithstanding the fact that the government has to a large extent seen that this was an error, the fact remains that the prejudice is strongly ingrained in the minds of the people to-day.

It is true that individual manufacturers and individual buyers throughout the industry are completely converted to the necessity of the jobber, but this opinion should be shared by all.

The Electrical Supply Jobbers' Association, in gathering statistics and interchanging ideas and information regarding business methods, has done a splendid work in educating its members to improve the service they are prepared to render, to improve their own operating conditions and to strengthen themselves in the industry; but it seems to your committee that this work should not stop there, but should extend its undoubted benefits to the jobbers' customers and eventually the public in general and thus complete its work.

Individually, all that we advocate in favor of the publicity campaign has been done by the individual jobber, but we feel that collectively this work can be made much more effective. What an individual jobber may do or may claim along these lines is discounted by the hearer or reader as trade talk. This same work backed by the Electrical Supply Jobbers' Association would carry the necessary weight and become effective.

There is a widespread misunderstanding throughout the trade as to the real purposes of the association. This misunderstanding, for the good of the association and its members and in the interest of mutual coöperation between different classes of trade, should be removed.

Many matters are brought to light in discussions in association meetings which, if collected through statistics, would be of great interest to buyers as well as jobbers themselves; but the only way to get this information before the buyer is through paid advertising combined with other publicity. The editors of reputable trade and technical papers are as much interested in building up the industry as we are, and they are ready and anxious to publish matter of real news value and of real interest to their readers; but a definite advertising and publicity plan is necessary to collect this information and see that it is put out in the proper manner and through the proper channels.

### WHAT AN ADVERTISING AND PUBLICITY CAMPAIGN MAY ACCOMPLISH

First—The removal from the minds of trade buyers, particularly those in the electrical trade, of the erroneous impression that the association does anything in the way of fixing resale prices.

Second—Educating buyers of electrical merchandise to purchase of electrical jobbers rather than of hardware jobbers, drug houses or other concerns not strictly engaged in the electrical business.

Third—Attracting the attention of manufacturers, especially new ones, to the service that members of the association may render them as mediums of distribution and marketing of their products.

Fourth—Impressing upon manufacturers the advantage to them of giving due consideration to the electrical jobber regardless of what their sales policy may be.

Fifth—Educating the buyer, especially those directly in the electrical business, to buy from the jobber rather than direct from the manufacturer and giving arguments in support of this.

Sixth—Calling the attention of the buyer to the stocks carried by the jobber and the geographical distribution of them, and consequent better service that may be given by a jobber than by a manufacturer, even on that manufacturer's own line.

Seventh—Educating the buyer to the wide diversity of articles and lines carried in jobbers' stocks.

Eighth—Directing the attention of all readers of trade journals to the fact that everything that may be advertised in the particular issue he is reading can be purchased by him from a jobber.

Ninth—Directing the attention of all readers of trade journals to the fact that the membership of the association undoubtedly includes one or more jobbers in his immediate locality who are prepared to render him a distinct service in furnishing goods advertised.

Tenth—Directing the attention of manufacturers to the Electrical Supply Jobbers' Association as including the best jobbers in the country, and thereby quite likely influencing the manufacturers to refer to the fact in their own advertisements that their products may be secured from members of the Electrical Supply Jobbers' Association.

Eleventh—Making the buyer familiar with the enormous aggregate in dollars and cents value of the stocks carried as a whole by the Electrical Supply Jobbers' Association members as a demonstration of the service they can render.

Twelfth—Directing the attention of electrical jobbers throughout the country, both members and non-members, to the real objects of the association and to the educational work it is carrying on for the benefit of the trade.

Thirteenth—Counteracting by dignified and businesslike arguments any tendency on the part of the government, the manufacturer, the contractor or any other interest to fail to accord to the jobber his rightful place in the industry.

Fourteenth—Directing the attention of the manufacturer to the enormous purchasing power of the jobber.

Fifteenth—Directing the attention of the manufacturer to the thoroughness with which the United States is covered by the activities of the jobber.

Sixteenth—Proving to the manufacturer that the jobber actually creates business in addition to acting as an economic distributer of the material involved.

Seventeenth—Proving to the manufacturer that the jobber can perform the functions of warehousing and distributing more efficiently and economically than the manufacturer can himself.

Eighteenth—Directing the buyer's attention, particularly during war times, to the fact that to take advantage of jobbers' stocks is one way of coöperating with the government, in that manufacturers are not loaded up with orders for material already in the jobber's warehouse.

Nineteenth—Directing the attention of the buyer to the service rendered by the jobber's salesmen, a small part of which nowadays is the actual soliciting and taking of orders.

Twentieth—Directing the attention of the manufacturer to the economy of marketing his product through the jobber from the standpoint of accounting as well as from the standpoint of warehousing and distributing.

Twenty-first—Creating in the minds of readers, especially those in the business, a proper realization of the jobbing business as occupying its own essential and peculiar position in the industry, and thereby counteracting the belief on the part of many central stations, and practically all contractors, that all they have to do to become jobbers is to announce the fact, rather than have them realize that it is a field requiring peculiar fitness from every standpoint.

Twenty-second—The building up of a spirit of good will on the part of buyers toward the jobber, a ready and prompt recognition of the service he is prepared to render, and a natural inclination to make use of that service.

### Advertising Mediums to Use and Why

The complete and ideal advertising campaign would involve paid advertising space and publicity not only in electrical trade journals, but in trade journals of other lines directly or indirectly connected with the electrical business, such, for instance, as journals distributed throughout the hardware trade, the drug trade, industrial plants, etc. Such advertising would be of direct benefit to jobbers of electrical supplies, but in the future your committee can see coöperation along advertising lines for the benefit of the jobbers in all lines between the various associations of the different lines, each association bearing a share of the expense involved, and such a campaign including not only trade journals of all classes of business but periodicals of national circulation.

Your committee, however, bases this report on making use to begin with of electrical trade journals only; in other words, the logical steps will be, first, an advertising campaign in electrical trade journals; then the inclusion of trade journals in other lines of business, and next a combination of advertising campaigns to include periodicals and other mediums of national circulation, the expense to be borne by the various associations.

The effect that such advertising will have on the minds of buyers now will be reflected in our ledgers during the reconstruction period.

Many of the objectors to this campaign give as their only argument the fact that no other association of jobbers has ever carried on such a campaign, but in the opinion of your committee this is an argument in favor of it, because it will be to the credit of the Electrical Supply Jobbers' Association that it take the initiative in advertising, and we believe jobbers' associations in other lines will eventually do the same, particularly if our association begins it.

# EMERGENCY AND TEST CENTERS · VALUABLE DISTRIBUTION AIDS

## Circuits Arranged So that Even Complete Failure of Large Substation Would Not Long Deprive Customers of Electric Service

DURING the war period that has just closed a simple and effective method of emergency operation was evolved by the Commonwealth Edison Company of Chicago that can be used to advantage in connection with distribution systems even in times of peace, as can many of the methods worked out during the national emergency. In the case under consideration the construction required is of two rather similar types. One is the emergency center used for transferring load, and the other is the test center used for locating and eliminating a section of outlying line which is in trouble.

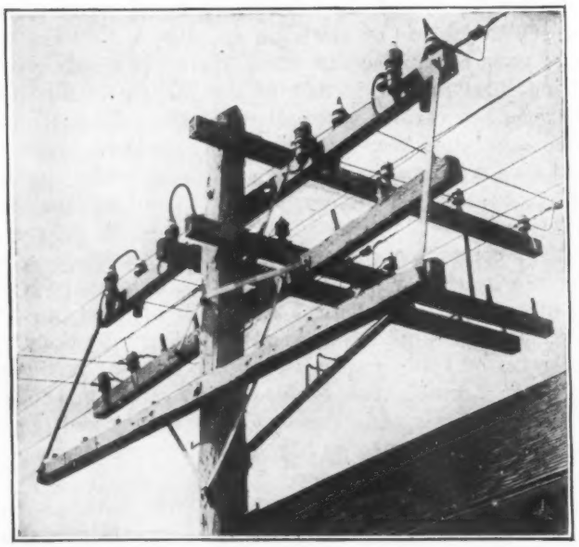

FIG. 1—EMERGENCY CENTER ON WHICH DOUBLE POTHEAD CONSTRUCTION IS VISIBLE

Both are used exclusively on the company's 60-cycle, 4000-volt circuits.

Emergency centers are located on the overhead distribution system at points where the outer ends of circuits from two different substations come near together or where the ends of circuits from the same station are found in proximity to each other. Sometimes the centers can be installed without building extra line, and sometimes it is necessary to construct a few extra spans to bring the circuit ends together. In either case the standard construction employed consists of a combination of strain insulators and disconnecting potheads.

### DETAILS OF THE CONSTRUCTION

If it is desired to construct an emergency center between circuits from two adjacent substations, the ends of the circuits are connected mechanically but separated electrically by means of two porcelain strain insulators. Four disconnecting-type G. & W. potheads are then installed on a cross-arm installed at right angles to the line arm. Two complete potheads are used for each line wire (Fig. 2). The tap from the end of one wire is connected into the cap of one pothead, and the tap from the other side of the porcelain breaker is run into the bottom or tube of the other. Thus the tube of one pothead and the cap of the other are merely dummies which carry no electrical connections and which are used to keep the contacts of the live tube and the live cap in position and in good condition. When it is desired to

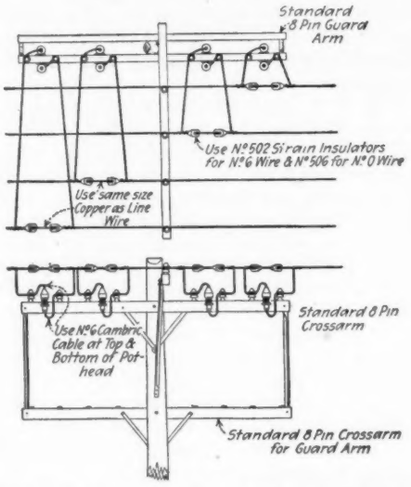
Standard 8 Pin Guard Arm
Use N°502 Strain Insulators for N°6 Wire & N°506 for N°0 Wire
Use same size Copper as Line Wire
Standard 8 Pin Crossarm
Use N°6 Cambric Cable at Top & Bottom of Pothead
Standard 8 Pin Crossarm for Guard Arm

FIG. 2—WORKING DRAWING OF A TYPICAL EMERGENCY CENTER

connect the two circuits together, the live cap is placed upon the live tube, thereby making the electrical connection between the ends of the two circuits. This forms a jumper around the porcelain breakers through the pothead. The same practice is followed for install-

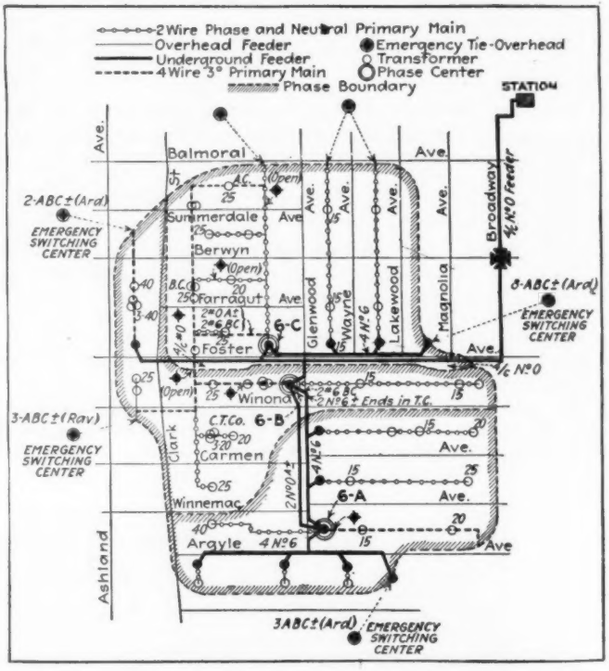


FIG. 3—ACTUAL MAP OF A SECTION OF DISTRIBUTION SYSTEM, SHOWING LOCATION OF EMERGENCY CENTERS

ing an emergency center between two circuits from the same stations.

The practical value of this arrangement is that these emergency connections permit the load in any given district to be fed from two or more directions. Within that portion of Chicago bounded by a line drawn through the company's farthest outlying substations

every customer can be fed from two or more directions. Moreover, if a large substation should by any chance become completely disabled, the load it serves could be almost completely picked up by surrounding stations in less than one and a half hours, whereas under other circumstances all customers would have to await repairs to the substation. Unavoidable operating troubles which have occurred in the last summer have been remedied so quickly that they have each demonstrated the emergency centers to be worth many times their cost. Moreover, when load from a damaged station can be picked up by surrounding stations through these emergency centers, temporary repairs at the damaged station can be avoided. Hence the actual cost of making repairs can be reduced.

The test centers, which are of somewhat similar construction, are generally installed in outlying sections of the city where branches of a line leave a terminal pole in several directions. Here the potheads are installed directly in series with the line so that all but one of the branches may be "killed" to assist in locating trouble. As the system grows these test centers are often converted into emergency centers. Here again the simplicity of this type of construction becomes its outstanding feature, since the change can be made by merely changing pothead connections. It is a fact that as the loads shift and grow a certain pole may be now a test center, later an emergency center, and again a test center, without the necessity of cutting or splicing lines or depriving any customer of continuous service. By setting the regulators of the circuits which are to be rearranged on neutral points and placing the circuits upon the same bus, the changes out on the lines can be made at will by shifting the disconnecting potheads. Such an arrangement is found to make the distribution system really flexible. Moreover, it reduces to a minimum labor costs incident to keeping the distribution system in continuous operation.

# Investigation of Conductor Heating

## Since Motors Are Given Short Time Ratings, There Appears to Be No Reason Why the Feeding Wires Should Not Be Given Higher Ratings for Short-Time Loads than Those Given to Them for Continuous Loads

BY HENRY C. HORSTMANN AND VICTOR H. TOUSLEY

THE horsepower rating of a motor depends usually upon the temperature rise caused by the current necessary to develop the required torque and speed. Thus a motor which has a 100-hp. rating for continuous service may be given several times this rating provided that it will not be called upon to develop this horsepower for any great length of time. Since such a motor can be used only for short intervals, and as it does not cool so rapidly as the conductors which feed it, it seems reasonable to give the conductors the same rating as the motor. In other words, they should not be required to have a capacity sufficient to carry the motor current continuously.

The current in amperes which will cause a certain temperature rise in a given conductor in a fixed time can be found by the formula $I = i(\sqrt{T/t})$, where $T$ equals the limiting temperature, $t$ the temperature rise caused in the conductor by the current $i$ in the time given, and $I$ the current which will cause the rise to $T$ deg. above the surrounding air. The values of $t$ corresponding to the various sizes of wire and length of time considered are given in Table I and represent the temperature rises caused by the currents in amperes given in column $i$ at the left.

The current given is that authorized by the National Electrical Code, and the values of $t$ have all been experimentally obtained with the exception of those given for 300,000-circ.mil and 400,000-circ.mil cables. The figures given for these cables are based on the assumption that the carrying capacities given are in proper proportion. If this assumption is correct, the temperature rise of the two untested cables will be slightly more rapid than indicated. The more rapid rise is due to the greater relative surface for convection and radiation for the smaller conductors.

In Table II the currents permissible for short-time use have been calculated according to the formula given and for a temperature rise of 20 deg. C. As in previous

TABLE I—VALUES OF TEMPERATURE RISE

| | | Time in Minutes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| B. & S. | $i$ | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 |
| 14 | 15 | 5.2 | 7.6 | 9.4 | 10.5 | 11.4 | 12.1 | 13.3 | 14.0 | 14.6 |
| 12 | 20 | 6.4 | 9.4 | 11.6 | 13.0 | 14.2 | 15.0 | 16.2 | 16.8 | 17.2 |
| 10 | 25 | 5.6 | 8.2 | 10.0 | 11.6 | 12.6 | 13.5 | 14.7 | 15.4 | 15.6 |
| 8 | 35 | 5.6 | 8.0 | 9.7 | 11.0 | 12.2 | 13.0 | 14.2 | 15.2 | 15.9 |
| 6 | 50 | 3.8 | 6.9 | 9.2 | 10.8 | 12.1 | 13.2 | 14.8 | 16.1 | 17.1 |
| 4 | 70 | 4.6 | 7.2 | 9.3 | 11.3 | 12.9 | 14.3 | 16.5 | 18.1 | 19.5 |
| 3 | 80 | 4.2 | 6.6 | 8.4 | 10.0 | 11.5 | 12.8 | 15.0 | 16.4 | 17.5 |
| 2 | 90 | 4.0 | 6.4 | 8.5 | 10.1 | 11.5 | 12.6 | 14.6 | 16.1 | 17.2 |
| 1 | 100 | 3.2 | 6.0 | 8.3 | 10.1 | 11.6 | 12.8 | 14.8 | 16.6 | 18.2 |
| 0 | 125 | 2.4 | 4.9 | 6.8 | 8.5 | 10.0 | 11.5 | 14.0 | 15.8 | 17.2 |
| 2/0 | 150 | 4.0 | 6.4 | 8.2 | 9.9 | 11.4 | 12.6 | 14.9 | 16.8 | 18.3 |
| 3/0 | 175 | 2.8 | 5.0 | 6.7 | 8.2 | 9.4 | 10.5 | 12.4 | 14.0 | 15.4 |
| 4/0 | 225 | 3.2 | 6.0 | 8.5 | 11.0 | 13.0 | 14.8 | 18.1 | 20.8 | 23.2 |
| 300,000 | 275 | 1.9 | 3.6 | 5.0 | 6.3 | 7.7 | 8.9 | 11.0 | 13.0 | 14.6 |
| 400,000 | 325 | 1.9 | 3.6 | 5.0 | 6.3 | 7.7 | 8.9 | 11.0 | 13.0 | 14.6 |
| 500,000 | 400 | 1.9 | 3.6 | 5.0 | 6.3 | 7.7 | 8.9 | 11.0 | 13.0 | 14.6 |

TABLE II—CURRENTS FOR 20 DEG. C. TEMPERATURE RISE

| | | Time Rating of Motor in Minutes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| B. & S. | $i$ | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 |
| 14 | 15 | 29.4 | 24.3 | 21.9 | 20.7 | 19.8 | 19.2 | 18.3 | 18.0 | 17.5 |
| 12 | 20 | 35.4 | 29.2 | 26.2 | 24.8 | 23.8 | 23.0 | 22.2 | 21.8 | 21.6 |
| 10 | 25 | 47.2 | 39.0 | 35.2 | 32.7 | 31.5 | 30.5 | 29.0 | 28.5 | 28.2 |
| 8 | 35 | 66.1 | 55.3 | 50.0 | 47.2 | 44.8 | 43.4 | 41.6 | 39.9 | 39.2 |
| 6 | 50 | 114.0 | 85.0 | 73.5 | 68.0 | 64.0 | 61.5 | 58.0 | 55.6 | 54 0 |
| 4 | 70 | 145.6 | 116.9 | 102.2 | 93.1 | 86.8 | 82.6 | 77.0 | 73.5 | 70.7 |
| 3 | 80 | 174.4 | 139.2 | 123.2 | 112.8 | 105.6 | 100.0 | 92.0 | 88.0 | 85.6 |
| 2 | 90 | 200.7 | 159.3 | 137.7 | 127.0 | 118.8 | 113.4 | 105.3 | 104.4 | 97.2 |
| 1 | 100 | 250.0 | 182.0 | 155.0 | 141.0 | 131.0 | 125.0 | 116.0 | 109.5 | 104.8 |
| 0 | 125 | 360.0 | 252.5 | 213.7 | 191.2 | 176.2 | 165.0 | 148.7 | 145.0 | 133.7 |
| 2/0 | 150 | 334.5 | 264.0 | 234.0 | 213.0 | 128.0 | 189.0 | 174.0 | 163.5 | 154.2 |
| 3/0 | 175 | 463.7 | 350.0 | 302.7 | 273.0 | 255.5 | 241.5 | 222.2 | 209.2 | 199.5 |
| 4/0 | 225 | 562.0 | 409.5 | 344.2 | 303.7 | 279.0 | 261.0 | 236.2 | 220.5 | 207.0 |
| 300,000 | 275 | 891.0 | 649.0 | 550.0 | 489.5 | 442.7 | 412.5 | 371.2 | 341.0 | 280.0 |
| 400,000 | 325 | 105.30 | 767.0 | 650.0 | 578.5 | 523.2 | 487.5 | 438.7 | 403.0 | 331.5 |
| 500,000 | 400 | 1296.0 | 944.0 | 800.0 | 712.0 | 644.0 | 600.0 | 540.0 | 496.0 | 408.0 |

tables,* no attempt has been made to make corrections for change of resistance with temperature.

From the data in this and foregoing articles it seems quite evident that the tables of carrying capacities in general use could be improved by a careful revision aimed at listing currents which will cause the same maximum temperature rise in all conductors. In view of the present high price of copper, conduit and labor, it also seems advisable to consider carefully whether it is not permissible to give a materially increased current rating to conductors subject to intermittent loads of short duration. This, of course, would mean a modification of the old rule that wires must never be overfused.

## EDUCATING ENGINEERS IN ENGLISH COLLEGES

### Sir Henry Miers Describes Present Tendencies—Getting Into Closer Touch with the Industries an Important Object

Speaking at Boston, Mass., during the recent meeting to promote engineering education, Sir Henry Miers, F.R.S., vice-chancellor of the University of Manchester, England, commented upon the effect of the war and on present tendencies. He spoke of the calling of industrial specialists into the lecture room as most desirable.

Too much attention, the speaker thought, is being given to-day to the needs of the rank and file of the profession rather than to training men for the broadest and heaviest responsibilities. The universities in England are trying to get more closely in touch with the industries. Firms are introducing scholarships to train qualified young men for research. A strong demand for non-vocational training is now being met by the universities. The workers look with suspicion on any training which patently tends to increase their efficiency of production, but are seeking cultural education. Sir Henry Miers also emphasized the importance of training engineers in industrial history and social economics during their professional courses.

*See ELECTRICAL WORLD, Nov. 14, 1918, p. 489, and Oct. 12, 1918, p. 690.

## REBUILDING ARC LAMPS AS INCANDESCENT FIXTURES

### Salvage of Useful Parts and Employment of Inexpensive Labor Brings Down Cost of Rebuilt Street Lamps to $8.73 Each

BY W. B. TURNER

WHEN the Memphis Gas & Electric Company decided to change its street lighting from an arc-lamp system to a system of incandescent lamps it had in stock and in service about 1800 old 7.5-amp. General Electric inclosed-arc lamps. The past experiences of the company's engineering and operating departments in building all of the transformers used by the company gave rise to the belief that it might be possible to save money by rebuilding its street lamps as well, using parts of the old arc lamps. After investigating the characteristics and prices of several incandescent lighting fixtures then on the market, the engineers designed a lamp which was somewhat different from any of these and which would permit the use of parts of the old arc lamp. The new lamps were to be of two types, namely, a 7.5/20-amp., 600-cp. series lamp and a 400-cp. multiple lamp.

Construction of the latter was a comparatively simple matter. The work consisted merely of cleaning the operating mechanism out of the old lamps and inserting in its stead a "mogul" socket on a 6-in. (15-cm.) piece of iron pipe and attaching a new cast-iron ventilating shade holder. All of the parts required are shown in an exploded view (Fig. 4).

Since the series lamp was designed with a compensator in the hood its manufacture was somewhat more of a problem. The compensator required was to operate at 7.5 amp. on the primary and 20 amp. on the secondary. The laminated core was made of pieces of transformed iron too small to be of use in building larger transformers. They were, therefore, virtually scrap. The windings were made of magnet wire. The completed compensator was placed in a stirrup-shaped cast-iron frame, and the whole affair was dipped in a quick-drying varnish. Wooden wedges, which were then driven between

FIGS. 1, 2 AND 3—THE OLD ARC LAMP AND THE TWO NEW TYPES OF INCANDESCENT LAMPS MADE FROM SOME OF ITS PARTS

the edges of the compensator and the stirrup, held the compensator in place and made a very rugged unit. The top of the casting, which had previously been tapped for machine screws, was then fastened to the head of the old arc lamp. To the bottom of this stirrup-shaped casting the receptacle for the gas-filled lamp was attached.

FIGS. 4 AND 5—PARTS OF A 400-CP. MULTIPLE LAMP; DETAILED VIEW OF COMPENSATOR DISASSEMBLED AT THE LEFT IN FIG. 5 AND ASSEMBLED UNIT AT THE RIGHT

This design had the advantage that the casting required very little machining, and it permitted the use of the head jacket and porcelain shade of the old lamp. A cast-iron ventilating ring adapter of the same sort used on the multiple lamp was employed to hold the Holophane band refactor. The compensator as built has a high efficiency and gives regulation within limits closer than 1 per cent of the secondary with normal primary current. Of the 1600 lamps of this type only three have showed defects, and all have now been in service from six months to eighteen months.

ITEMIZED COST OF SERIES LAMPS

| | |
|---|---|
| 20 amp. gas-filled lamp | $3.30 |
| Holophane band refractor | 3.15 |
| Cleat receptacle | .41 |
| Magnet wire | .82 |
| Iron laminations | .33 |
| Castings | .35 |
| Insulation, etc | .50 |
| Labor | 1.82 |
| Total | $10.68 |
| Less value of scrap from old arc lamps | 1.95 |
| Cost per lamp | $8.73 |

The labor used in the manufacture of the lamps was the regular central-station shop force plus a few schoolboys employed in the summer months. Throughout the job it was the policy not to let the lamp reconstruction work interfere with regular routine operation. The saving effected by using the old lamps and the inexpensive labor, if it is taken into account that the company got $1.95 each as the scrap value of the parts of old lamps not used, was nearly 50 per cent of the best price at which lamps of equal quality could have been purchased by the company, even on a quantity basis. A detailed statement of the cost of the series lamps is given herewith.

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SOME anxiously ask, "What has become of our form of government?" In saving the world have we lost our Republic? The astounding spectacle of centralized control which we have witnessed has confused many and turned the heads of some. But this, for the most part, has been the manifestation of the Republic in arms, fighting as a unit, with powers essential to self-preservation, which the Constitution not only did not deny but itself conferred. So far as we have harnessed our strength for war we were acting under the Constitution and not in violation of it. Wherever in the desire to take advantage of the situation for the purpose of fastening some new policy upon the country there has been resort to arbitrary power through acts unjustified by real or substantial relation to a state of actual war, such acts will receive the condemnation they deserve when they are brought to the determination of the proper tribunals.—*Charles E. Hughes.*

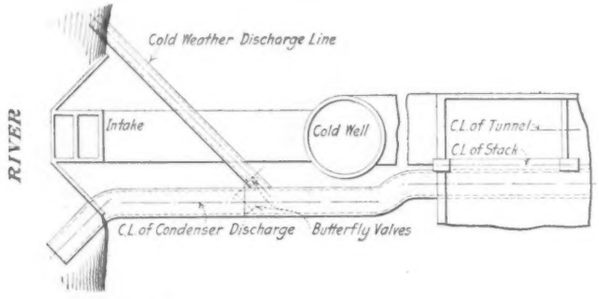
# STATION & OPERATING PRACTICE

## A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

## INTAKE IS DESIGNED TO REDUCE ICE TROUBLES

### Warm Water Which Is Discharged Upstream in Cold Weather Passes Mouth of Intake Tunnel to Melt Ice Formations

A cold-weather by-pass to reduce ice troubles in the condenser intake has been incorporated in the discharge tunnel of the Mansfield (Ohio) Electric Light & Power Company new power station. The main intake and discharge tunnels are laid out in the usual manner with




LAYOUT TO MELT ICE FROM DISCHARGE TUNNEL

the intake farther up-stream than the discharge. Branching off from the discharge tunnel, however, is a cold-weather discharge line which can be operated to eject warm condensing water upstream above the intake. This is the feature of the installation.

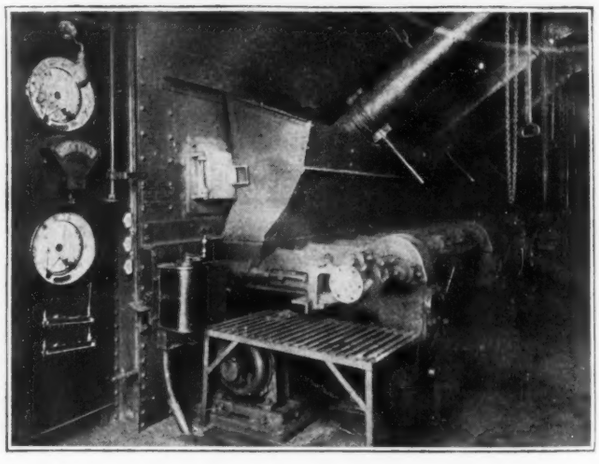
When anchor or fragile ice which might obstruct the intake is forming in the river this cold weather line is opened and butterfly valves in the main condenser discharge tunnel are partly closed. The warmer water passing the intake tunnel successfully clears the intake tunnel of objectionable ice.

## FUEL-SAVING CAMPAIGN IN CONNECTICUT PLANTS

### Kilowatt-Hours per Pound of Coal the Basis—Employees Share in Prize for Any Improvement in Economy Effected

An energetic campaign to save fuel is at present in progress in Connecticut, and a number of central stations are making regular reports to the state fuel administration upon which they are graded and which afford a basis for periodic comparisons of operating efficiency. A base figure expressed in pounds of coal consumed per kilowatt-hour of output is selected for each plant, and in some cases plant groups are daily exchanging operating data as a stimulus to more efficient service. The results of this interchange and friendly rivalry are not yet available, but the following data from the Hartford Electric Light Company are interesting as showing how plant performance is being improved under the incentives of up-to-date equipment and bonuses.

At Hartford a second 10,000-kw. steam turbine was placed in service about Aug. 1. The best monthly output previously secured from the company's Dutch Point station was 945 kw.-hr. per ton of coal. The management offered the station employees the following prizes for the month of August: For attaining 950 kw.-hr. per ton, $250; for reaching 1000 kw.-hr. per ton, $500, and for producing 1050 kw.-hr. per ton, $1,000. August operation resulted in the production of 1035 kw.-hr. per ton, and the station employees consequently received $500, divided according to the number of men on the payroll and without regard to the position, duties or time of service of any individual. No prize was offered for September, but toward the end of the month the station staff petitioned the management for another chance at cashing in upon efficiency gains, the September average having been about 1120 kw.-hr. per ton. This figure was established by the management as the base for October, and it was announced that if it was attained $1,500 would be awarded. The October figure was 1310 kw.-hr. per ton, a gain in efficiency of 38 per cent over the August base. From Nov. 1 to Nov. 20, 1918, this plant has produced 6,000,000 kw.-hr. with a coal consumption of 4400 tons, compared with 4,600,000



BOILER-ROOM ACCESSORIES THAT HELP

On the panel at left, starting at the top, are steam-flow meter for superheated steam, indicating draft gage, steam-flow meter for steam supplied to auxiliaries, and two draft gages—one connected over fire and other to back. The underfeed stokers can be driven at any one of four speeds. It is the plan to mount the indicating draft gages higher on the panel so that they may be read without stooping. The recording auxiliary flow meter will be placed below draft gages in the future.

kw.-hr. for the corresponding period of last year, when 5400 tons of coal were burned.

The November savings are in part due to a better quality of coal compared with 1917, but the improvement in efficiency since Aug. 1 is due partly to the

utilization of the company's second 10,000-kw. turbine in place of one 2000-kw. and two 4000-kw. units now held in reserve. However, the effect of increased interest in station efficiency displayed by every one on the staff at Dutch Point, which is exhibited in close coöperation between the individuals and shifts in the interest of maximum economy of production should not be discounted.

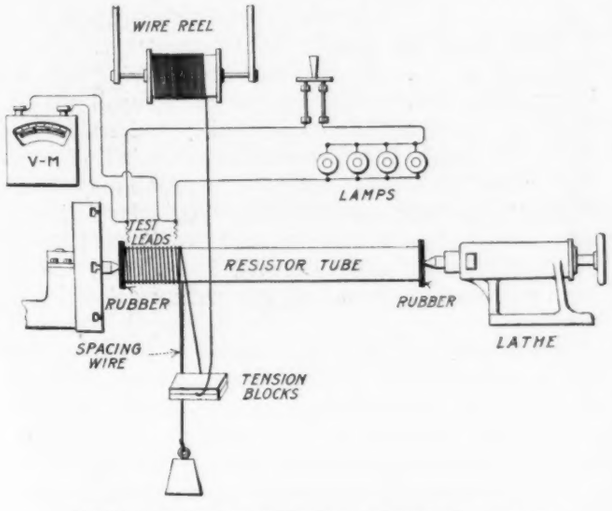
## AVOIDING INTERRUPTION BY REPAIRING RESISTORS

### How Size Is Easily Determined—Method of Spacing Turns Properly on Lathe—Spare Units Kept on Hand

BY H. S. RICH

Resistance coils for direct-current motor starters, mercury-vapor lamps, rheostats or almost any other purpose can be repaired without having to wait for new ones from the manufacturer. The writer has avoided many hours' delay and annoyance by following the method described herein.

Generally when a resistance coil in a starter burns out temporary operation is permitted by connecting the good coils on each side of the defective one. To replace the damaged unit the line current is shut off and a few lamps are connected to the cut-out in series with the terminals of a similar good resistance coil. With a low-reading voltmeter the exact drop in voltage across the good coil from end to end is obtained. Then as the defective coil is rewound with similar-size wire the same number of lamps at the same voltage are connected with the winding and the drop in voltage is tested to determine whether too little or too much wire has been applied. By winding on a few overlapping turns at each end and twisting them tightly the coil is ready for use.




METHOD USED FOR REPAIRING RESISTANCE COILS

When time permits, instead of winding only one coil, sometimes two or more are prepared, tagged and kept in stock. Regular resistance wire is more satisfactory than common iron wire.

To rewind the coils a small power lathe may be employed and run very slowly. Rubber packing may be used between the centers and resistor tube to form a cushion and avoid breaking the tube. The resistance wire can be fed from a suspended reel and run through two small blocks to keep it taut. It is first wound on one end with three or four turns crossing each other to make a tight start. A loop of similar-sized wire hung over the tube and held taut with a weight below the lathe will serve to space the resistance wire properly. As the tube is rotated the resistance wire being applied finds its place by running alongside the suspended loop, which in turn travels along the tube adjacent to the resistance wire already supplied. At the end a few tight turns can be made and the suspended loop removed, leaving the resistance wire evenly spaced by its own diameter and presenting a neat appearance.

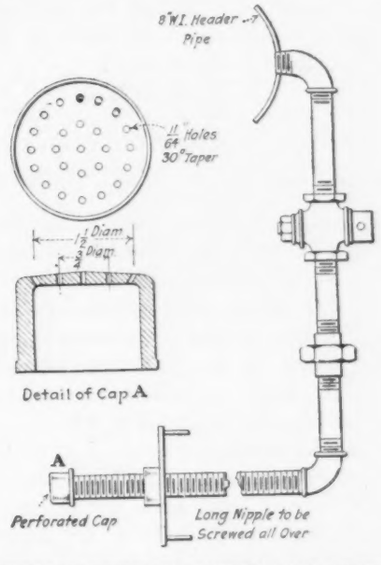
Tests for voltage drop can be made any minute by stopping the lathe and applying the lamp terminals, which should be all ready for instant use. Dollars and hours, which mean much to a busy concern, have thus been saved in one particular plant.

## COMBINED COAL AND GAS FIRING

### Coal Is Supplied by Underfeed Stokers in Front of Boilers, While Gas Enters at Rear

Both gas and coal are burned under the eight 512-hp. Stirling boilers in the plant of the Mansfield (Ohio) Electric Light & Power Company. Gas is the principal fuel, but coal is burned during gas shortages. The boiler room is laid out so that the boilers are in two parallel rows facing a central firing aisle. Westinghouse underfeed double-dump stokers front on this aisle. Gas is fired through specially designed burners installed at the rear of the boilers. A detail drawing of the gas burner is shown here.

The selection of a combination of fuels was dictated




SPECIALLY DESIGNED NATURAL-GAS BURNER

by unusual local conditions. The company has available new gas wells on its own station site and on adjacent land. From these wells gas is available in considerable supply. The provision for an emergency fuel was, however, felt to be necessary. An emergency supply of coal is kept available in a large semi-natural coal-storage pit.

# CENTRAL STATION SERVICE

## A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

### EFFECT OF DAYLIGHT SAVING ON IOWA CENTRAL STATIONS

**Cost of Saving Is Considered to Be Out of Proportion to Its Value When Patriotic Motive No Longer Exists**

Indications are that the daylight-saving plan, as viewed in retrospect by Iowa central-station men, is not considered highly satisfactory. No extensive investigation of its effects has been made in Iowa, but numerous specific cases have come to light which show in general what has happened. The case of the Iowa Gas & Electric Company, Washington, Iowa, is typical. This is a company which operates in fourteen small communities. Its generator capacity is approximately 100 kw. For the week ended Nov. 2 the amount of electricity distributed over its territory was 9 per cent greater than for the week ended Oct. 26. The coal consumption was only 5⅜ per cent greater. The management figures that the net income has been reduced between 5 per cent and 5½ per cent by daylight saving, and that the actual coal saving in the seven months will not exceed 80 tons.

Again, take data collected by the Iowa Railway & Light Company of Cedar Rapids. At Marshalltown, which has a population of 16,000, the company's revenue has been reduced 11 per cent and its station output 8 per cent, and the belief is that the coal saving is negligible because of the small decrease in load as compared with station standby losses.

### MEANS OF INCREASING INCANDESCENT LAMP SALES

**New Orleans Utility Gets Good Results from Its Policy of Paying Commissions to all Employees on Lamp Sales**

Some interesting figures are given by the New Orleans (La.) Railway & Light Company showing the result of the action of the Fuel Administration in requesting that except in special cases no further renewals of "gem" and carbon lamps be made.

As soon as the recommendations were made by the fuel board, the company began an intensive educational campaign for the purpose of bringing them to the attention of all lamp users in order to induce the adoption of tungsten lamps throughout the New Orleans territory.

As a result of this campaign, the sales of tungsten lamps for the month of October increased over 50 per cent, and a total of $3,248 worth were sold within the thirty-day period. With a volume of this kind the profit on the company's lamp sales now becomes a considerable portion of the total merchandising and jobbing business and contributes a very satisfactory amount toward the upkeep of the commercial department.

One influence which has resulted in greatly increasing lamp sales for the New Orleans company has been the paying of commissions on lamp sales not only to the members of the commercial department but to inspectors, metermen and linemen. This policy has been in effect about six months and has developed a surprising amount of business. Men of the other departments see in it an opportunity to increase their income and are turning in orders continually, secured from customers with whom they come in contact either in a business or social way.

Customers are permitted to pay for their lamps in three installments, and this has also proved of material assistance in increasing gross sales. This is all the more apparent when it is pointed out that the customers are urged to buy lamps by the carton rather than individually as needed.

### STREET-LIGHTING REBATES IN CURTAILMENT PERIOD

**Two Connecticut Utilities Used Different Methods, One Making Flat Return and the Other Basing Rebate on Fuel Saving**

Rebates on street-lighting service were returned to the cities of Bridgeport and Hartford, Conn., during the recent period of lighting curtailment by the central stations operating there. At Bridgeport the United Illuminating Company operates about 350 4-amp. arc lamps of the "white-way" type and also supplies energy to a large number of series arc and incandescent lamps. The curtailment of service required shutting off 40 per cent of the "white-way" lamps, none of the other street-lighting units being cut off. For the regular series arc-lamp service, 4 amp., the city pays $65.70 per lamp per year, and for the incandescents, 80-cp. each, $20 per lamp per year. The rate on the ornamental arc lamps is $78.17 each.

It will be seen that for cutting off 40 per cent of the ornamental units the company rebated the city $500 in a three months' period, which expired shortly after the close of hostilities abroad. This rebate was agreed upon after conference with the city authorities, but it considerably exceeds the maximum saving possible to the company from service curtailment. In spite of the advance in the cost of labor and materials, the company has not increased its street-lighting rate, and it is estimated that not more than 33 tons of coal was saved during the ninety-day curtailment by the mere shutting down of lamps. Taking trimming, inspection, cleaning and repairs into account and omitting fixed charges, it is doubtful if the company could save over $1 per

month per ornamental arc lamp, and it is unquestionably out of pocket by rebating. The rates for this service at Bridgeport are fixed by agreement rather than by a contract of stated term.

The Hartford Electric Light Company furnishes street lighting on a five-year contract terminating in 1919. There are no arc lamps in the city service. About $205 was rebated to the city during the first quarter of 1918, this figure being based upon a theoretical saving in fuel gained by cutting off about one-half hour of burning in the early morning.

## COMMERCIAL OPPORTUNITIES OF THE CENTRAL STATIONS

### Where There Are Heavy Load Conditions High-Rate Business Can Be Developed—Western Manager's Plan

Central stations which for long have not been especially active in seeking new business are now thinking over plans for commercial development. Many of the opportunities are to be found virtually everywhere and are summed up by H. E. Young, sales manager of the Minneapolis General Electric Company, as follows:

"We plan to take back as many of our old men as wish to return and have already received inquiries from several of them. When this is done, our sales force will undoubtedly be as large as before the war, if not larger.

"From present indications, we shall be able to use to advantage all these men, as at the present time we are unable to begin covering the many opportunities for investigating and getting new business on the lines which are in the field ready for salesmen to work on. Of course, to begin with, we will not attempt to get large quantities of power business on the lines until such time as our capacity has been developed to take care of a large amount of new business. We will confine our efforts to selecting the choicest and more profitable of this class of business.

"However, we will get the information on all power business which offers reasonably good prospective closing so that we shall have a complete analysis as to operating cost and sufficient information to prepare a comparison of cost for such a prospect when the proper time arrives.

"We shall undoubtedly do a considerable amount of work in developing commercial lighting business, which on account of the widespread curtailment propaganda has been considerably reduced and which we feel is worth some effort to get back at least to its former position. Besides this, the many commercial establishments which never were up to standard in the way of interior illumination, window lighting, signs, etc., offer another field for still further development.

"We have never really let up in our house-wiring efforts, although we expected that the house-wiring campaign we conducted last fall would be our last one until after the war. We will now continue our efforts in this direction, as this is business right on our lines, requiring virtually no investment and paying the highest kilowatt-hour rate.

"In the way of merchandising of electrical appliances we will continue our present policy but undoubtedly will put forth still more effort than we have in the past.

"Our electric range department has been cut down for more than a year to a force of only one or two employees, which permitted of virtually nothing more than showing the ranges in the display room, no outside effort being possible with this small force. Furthermore, we have been selling all ranges on a strictly cash basis, charging full list price plus the full contractor's cost of doing the wiring in the house, and if any expense was necessary on our part in the way of outside construction work, the customer had this to pay also. Nevertheless, we have averaged from twelve to fifteen ranges per month during the year, although our rate for electric cooking has been increased 20 per cent in the meantime.

"We have no immediate plans for returning to the active promotion of the electric cooking and range sales as practiced two years ago, but this will doubtless come about gradually as conditions change."

## RULES FOR FINANCING EXTENSIONS IN JOPLIN

### By Plan Adopted a Deposit Is Required for Poles and Line Erected, Service Drop Not Included

The new rules for financing extensions during the period of heavy prices inaugurated by the Empire District Electric Company, Joplin, Mo., on recommendation of the State Public Service Commission, provide for a deposit of $30 for each pole and one span of line and $15 for each span of line without pole on all extensions of less than 5 hp. On power extensions of 5 hp. and more there is required a deposit sufficient to cover the entire estimated cost of the extension. No deposit, however, will be required for service drops of ordinary length.

Should the estimated cost of power extensions of 5 hp. or more exceed the actual cost, the difference is refunded to the customer upon completion of the line. Deposits are refunded to the customers at the rate of 25 per cent of the bill for each month for service of less than 5 hp. and at the rate of 10 per cent of the bill for power service of 5 hp. or more. In addition, provision is made for the semi-annual payment of interest on the unrefunded portion of all deposits at the rate of 6 per cent per annum.

In case an extension for service is made for a consumer and afterward other consumers are served from that extension, like percentages on monthly bills for service to such additional consumers are credited and paid to the owner of the deposit on the line originally until the whole deposit is refunded. The newcomers on the line are not required in this plan to make any deposit except as there is some necessary construction other than the regular service drop.

Provisions are made for refunding the balance of deposits on extensions with interest at the end of five years if not already taken care of. Provisions are also made for taking up with the commission the case of any extension where a difference of opinion arises between the customer and the company regarding the deposit.

# TECHNICAL THEORY & PRACTICE

## Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

### Generators, Motors and Transformers

*Faults in Generators and Motors.*—This is the third article of a series entitled "The Electrical Study Course" in which the discussion of open circuits in the field coils of motors and generators is concluded. In this article short circuits and grounds in armature and field windings are also taken up.—*Power*, Nov. 26, 1918.

*Guarantees for Temperature Rise in Electrical Machinery.*—A. E. DU PASQUIER.—The article has special reference to large turbo-generators. After critically discussing the British standardization rules and those of the American Institute of Electrical Engineers, the author comes to the following conclusions: That the British standardization regulations and the A. I. E. E. regulations require amendment in respect of total permissible observed temperatures and the correction factors to be applied as between the various methods of indicating temperatures; that the most accurate method of determining hottest-spot temperatures is by means of suitable thermocouples; that the increase of resistance methods be reserved for the rotating fields of modern turbo-generators; that in the larger units it is economical and reasonable to work the copper in a machine up to 150 deg. C.; that in such machines it is better to adopt as a guarantee of performance a maximum safe operating total temperature rather than a temperature rise. The rating of such machines should be the maximum kva. output obtainable without such total temperatures being exceeded.—*Transactions South African Institute of Electrical Engineers*, July, 1918.

*Magnetization of Three-Phase Transformers.*—A. MANDL.—The magnetization of the three-phase transformer with saturated limbs is investigated, with particular reference to the distortion of the wave-shape of the magnetizing currents in the three limbs by the hysteresis in the iron. The main subject that is discussed is the mode in which a transformer in star connection, without neutral conductor, can be magnetized by a voltage strictly following the sine law.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, April 21 and April 28, 1918.)

*Heating of Machines and Transformers.*—J. FISCHER-HINNEN.—At the present moment it is no longer the commutation but the heating that appears to give the greatest difficulty, and the object of the article is to collect the information available on this point and to supplement it where necessary. The reduction of heating by ventilation is effective, but demands expensive installations of blowers, filters, etc., without which the insides of the machines become contaminated with dust or with a mixture of dust and oil which is most destructive. On this account a machine giving a certain temperature rise with the least artificial ventilation is the preferable one. The author goes into details of the methods of calculating the temperature rise on continuous load, allowing for the radiation, convection and the chimney action in ventilating ducts, and discusses what should really be regarded as the radiating surface. Regarding the chimney action, tests are described on resistors inclosed in tubes, and a formula is found connecting the reduction of temperature caused by the chimney action of the ascending air. Regarding the cooling surface, it is pointed out that it is not of great importance to discuss what parts of the surface should be regarded as radiating, as the temperature rise can be correctly arrived at using any method of estimating the radiating surface, provided suitable constants are used. A table is given showing the radiating constants of various types of transformers, motors, field coils, commutators, generator windings, resistance coils, etc., for definite assumptions regarding the effective radiating surface. A discussion then follows on the calculation of the necessary volumes of air, oil or combinations of these two materials required for artificial cooling. The formulas obtained are applied to particular cases and the results compared with the values actually obtained on test. In conclusion the case of intermittent loading is considered in a similar manner. The article is a comprehensive survey of the methods of calculating temperature rises and should be of considerable use to designing engineers.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Elektrot. u. Maschinenbau*, May 5 and May 12, 1918.)

### Lamps and Lighting

*Some Modern Methods of Lighting.*—GEORGE H. STICKNEY.—The author discusses the selection of lamps, fixtures and control devices for the lighting of factories, offices and store buildings. The demands as to intensity, diffusion, direction and color of light and the factors influencing the spacing of lighting outlets are indicated. Cost comparisons of different systems are also put down.—*National Engineer*, October, 1918.

*Linking Science and Art in Lighting.*—M. LUCKIESH.—In the third of a series of articles by the author on this subject particular attention is given to lighting fixtures. It is pointed out that lighting fixtures may be handled largely from catalogs by using a small demonstrating room equipped so as to illustrate general lighting schemes rather than the display of each individual fixture.—*Electrical Review*, Dec. 7, 1918.

### Generation, Transmission and Distribution

*Getting Along with a Smaller Coal Pile.*—JOHNSON HEYWOOD.—It is said that economies approaching 50 per cent of the coal requirements in small steam plants of 200 hp. to 500 hp. can often be effected simply by putting the plants in good shape. The author calls attention to the necessity of covering all pipes with insulating material, properly insulating boiler and breeching,

keeping scale out of tubes, preventing air leaks in the boiler foundations, returning all drips to the boiler, keeping joints steam-tight, avoiding the use of live steam for heating the building and at the same time making use of any exhaust steam, taking indicator cards to check the valve settings, and proper instruction of firemen.—*Factory*, October, 1918.

*Cooling Losses in Internal-Combustion Engines.*—C. A. NORMAN.—With the aid of a formula derived from results of Dugald Clerk and others the effect of varying dimensions, stroke-to-bore ratio, expansion ratio and piston speed is investigated. Great expansion combined with a low stroke-to-bore ratio is found in general conducive to best efficiency. Large size, as well as very high speed, will in general reduce efficiency—large size by necessitating a low number of revolutions and extremely efficient cooling, very high speed by delayed combustion. The best speed and dimensions to be used in every individual case can be estimated by the use of this formula. The formula, while requiring further experimental verification, is offered merely as a basis for estimating as closely as may be done at the present time the extent to which cooling losses depend upon engine speeds and dimensions.—Paper before A. S. M. E. Convention, December, 1918.

*Some Experiences with Large-Capacity Reservoir Outlets.*—JAMES M. GAYLORD.—The writer describes specially designed gates for controlling the discharge of volumes of water under pressures above 200 ft. (60 m.). He suggests some of the difficulties which have been encountered in installations of this sort and shows how these have been overcome.—*Engineering News-Record*, Nov. 1, 1918.

*High-Pressure Gates in Dams for Waterworks and Irrigation Reviewed.*—D. W. COLE.—One of the very early waterworks installations using valves under considerable heads is that of the Sudbury Reservoir of the Boston waterworks, where sluicegates were operated under 65-ft. (20-m.) heads. Here and in similar waterworks installations a considerable vibration in the valves was noticeable, causing joints in the piping through the dam to be jarred loose. The experience at the Shoshone Dam, the Pathfinder and Roosevelt Dams, built by the Reclamation Service, led to the development of a balanced valve which might be operated either partially or fully opened. Ten 58-in. (147-cm.) balanced valves operating at 105-ft. (32-m.) heads and each discharging about 1000 cu.ft. (28 cu.m.) of water are described as installed at the Arrowrock Dam in Idaho. This is the highest dam in the world, being 348 ft. (106 m.) from its lowest foundation point to the crest.—*Engineering News-Record*, Nov. 14, 1918.

*Electricity as Factor in Reconstruction in France.*—The new constitution of the economic life of the invaded regions of France will not be possible without resort to electricity. A committee has been formed representing the electric power companies in the invaded regions. In the great majority of cases the electrical machinery, boilers, transmission lines, often the buildings themselves, have been destroyed. It has been agreed that, having a clean slate so far as old plants are concerned, advantage shall be taken of the opportunity for securing as largely as possible the standardization of new equipment and transmission systems. The adoption of this principle of standardization would make it possible for those interested to help one another most effectively because the machinery available would be capable of being used in one place as well as another. This flexibility will be of decided advantage before the complete power requirements have been restored. Other questions taken up by this committee are where these new generating units shall be installed and how the electric energy will be distributed. The committee is also to work out a plan by which the many small plants operating previously will now be replaced by fewer large generating systems.—*Fortnightly Information Leaflet*, Sept. 15, 1918.

*Hydroelectric Development in Ontario.*—ARTHUR H. HULL.—The author showed how the system of the Hydroelectric Power Commission had grown until there is more than 700,000 hp. in hydroelectric development now available. The extensive use to which electric power has been put is evident when the population of the province, two and a half million, is taken into consideration. The scarcity of coal, natural gas and oil have made hydroelectric development necessary. In the paper complete statistical data regarding the power site, hydraulic and electrical features of each development are put down, together with a résumé of the load conditions.—Paper read before the three hundred and forty-fourth meeting A. I. E. E., Nov. 22, 1918.

## Installation Systems and Appliances

*Use of Electricity on Gold Dredges.*—In the operation of gold dredges electricity is used almost universally as the motive power. The electrical equipment on these dredges usually comprises, in addition to the interior lighting and floodlighting, six or more motors having an average connected load of about 1000 hp. The largest motor now in use on any dredge is rated at 500 hp., but is capable of developing 700 hp. Owing to the severe strain to which the bucket motor is subjected when a boulder or hard ground is encountered, this motor has usually been belt-connected, but recent trials with a gear-connected motor using a large friction-disk clutch have been very successful. The pump motors are usually directly connected to centrifugal pumps, these pumps being used on account of the low head required and the large amount of water to be handled. Power requirements of typical dredges are given in cases where the motors are directly connected and also belted. Wherever possible central-station service is used by dredge companies in preference to manufacturing their own power. This is done not only on account of the lower power costs but also on account of the lower initial cost and because the use of this service takes much of the weight from the hull.—*Electrical Review*, Dec. 7, 1918.

*An Inclosed Rectifier.*—A rectifier suitable for use with alternating currents over a current and voltage range comparable to the capacity of a mercury-arc rectifier has been designed by G. S. Meikle. It differs from devices employing incandescent cathodes exhausted to a lamp vacuum in that an inert gas, usually argon, at a considerable pressure is injected into the inclosed medium.—*Wireless Age*, December, 1918.

*Electric Drive in a Mat Factory.*—Processes in the manufacture of fiber mats and matting are briefly set forth in this article, and it is shown that electric drive

may be economically applied to the process of straightening out the compressed fiber, of drying the dyed yarn, for storing the matting and for driving the textile machines proper.—London *Electrical Times*, Oct. 10, 1918.

*Electrical Equipment of Keadby Bridge.*—The second installment of this article covers the generating-plant equipment and more particularly the electrical control for lowering and raising the bridge.—London *Electrician*, Oct. 25, 1918.

### Electrophysics and Magnetism

*Theory of Hysteresis by Magnetization.*—K. HONDA and J. IKUBO.—It is shown how the loss for a given magnetizing field may be calculated, and the result is in agreement with the Steinmetz law. The theoretical deduction in the case of rotating fields conforms in character with the well-known experimental curves. Finally, the hysteresis loss in magnetite is considered and the results obtained agree with the experimental conclusions of Quittner.—*Science Abstracts*, April 30, 1918. (Abstracted from Tohoku University *Science Reports*, November, 1917.)

*Standard of Mutual Induction.*— A. GUILLET.—A description in detail of the method of construction of a standard mutual inductor with four lateral guard inductors. The calculation is given in full of the field due to a helical coil at any point along its axis. The end correction for the force in the interior of a helix of given dimensions and of finite length is then found, and it is shown that for work of high accuracy the method of end correction by successive displacements of the inductive winding is not sufficiently close.—*Science Abstracts, Section B*, September, 1918. (Abstracted from *Journal de Physique*, January-February and March-April, 1917.)

### Electrochemistry and Batteries

*Electrolytic and Electrothermic Processes and Products.*—The science and application of electrolysis and electrothermics are so very extensive and are changing so rapidly that it is almost impossible to give a complete review of the subject, and many of the latest developments are secrets closely guarded. This article attempts only a very brief outline of the most common electrolytic and electrothermic processes and their products. The writer points out that the layman little appreciates to what extent we are indebted to this art for many of our every-day materials, much less the degree to which it serves the government in supplying the materials of war. The information in this article is derived from published works and from articles in the technical press.—*General Electric Review*, November, 1918.

*Melting Brass in a Rocking Electric Furnace.*—H. W. GILLETT and A. E. RHOADS.—In the issue of Aug. 24, 1918, of the ELECTRICAL WORLD a brief description of this rocking electric furnace for brass melting as developed by the Bureau of Mines was printed. In the article here noticed some of the test data showing the comparative economy of such furnaces are given. The following tables contain analysis of energy losses in a rocking furnace working on ten-hour and twenty-four-hour schedules. It will be noted that the furnace efficiency on the ten-hour basis is 56 per cent but on the twenty-four-hour basis 70 per cent is reached.

HEAT BALANCE OF ROCKING FURNACE WORKING ON TEN-HOUR SCHEDULE

| | Kw.-Hr. | Per Cent |
|---|---|---|
| Loss in transformers and leads | 222 | 9 |
| Power used by motor for rocking the furnace | 28 | 1 |
| Loss in cooling water: | | |
| 7.5 kw. per hour for twenty hours (two days) | 150 | 8 |
| 2 kw. (estimated) per hour for twenty-eight hours (two nights) | 56 | .. |
| Power usefully applied (theoretical), 15,650 lb. at 8 kw.-hr. per 100 lb. melted | 1,252 | 51 |
| Balance left for shell radiation losses, forty-eight hours, and door losses while charging—twelve charges | 766 | 31 |
| Total | 2,474 | 100 |

HEAT BALANCE OF ROCKING FURNACE ON TWENTY-FOUR-HOUR SCHEDULE

| | Kw.-Hr. | Per Cent |
|---|---|---|
| Loss in transformer and leads | 374 | 8 |
| Motor | 43 | 1 |
| Loss in cooling water (48 × 7.5) | 360 | 7½ |
| Power usefully applied (theoretical), 36,500 lb. melted at 8 kw.-hr. per 100 lb | 2,920 | 64 |
| Balance left for shell radiation losses, forty-eight hours, and door losses while charging twenty-eight heats | 889 | 19½ |
| Total | 4,576 | 100 |

Comparing the melting costs of the rocking electric furnace with the coke-fired furnaces, these results are attained:

| | Normal Cost | Present Cost |
|---|---|---|
| Coke-Fired Furnaces: | | |
| Coke | $1.20 | $2.00 |
| Crucibles | 1.40 | 12.50 |
| Total | $2.60 | $14.50 |

Melting-cost comparison per ton of metal charged (labor cost omitted). Metal heated to 1160 deg. C.:

| | Ten-Hour Hour Day | Twenty-Four Hour Day |
|---|---|---|
| Electric Furnace: | | |
| Power | $3.40 | $2.65 |
| Interest and depreciation | 1.50 | 1.00 |
| Electrodes | .80 | .80 |
| Linings | .40 | .40 |
| Heating ladles | .25 | .25 |
| Incidentals | .25 | .25 |
| Total | $6.60 | $5.35 |
| Credit 1.5 per cent, or 30 lb. metal saved over coke-fired furnaces, at 15 cents | 4.50 | 4.50 |
| Total | $2.10 | $0.85 |

Calculated saving:

Ten-hour electric melting over coke melting, present conditions, $14.50 — — $2.10 = $12.40

Twenty-four-hour electric melting over coke melting, present conditions, $14.50 — $0.85 = $13.65.

Ten hour electric melting over coke melting, normal conditions, $2.60 — $2.10 = $0.50.

Twenty-four hour electric melting over coke melting, normal conditions, $2.60 — $0.85 = $1.75.

—*Bulletin 171, Bureau of Mines.*

### Telegraphy, Telephony and Signals

*Static and Interference Eliminated.*—An invention said to prevent the interference or crossing of one wireless message with another, regardless of the operation of any number of high-power stations, has been attributed to Roy A. Weagant of the Marconi company. It is said to reduce the amount of power usually required to operate a wireless station by about one-half. Among the revolutionary changes that the new system effects in wireless installations will be the disappearance of the huge steel towers heretofore built at great height to catch the incoming wireless waves.—*Wireless Age*, December, 1918.

# *Scientific and Industrial Research*

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Coöperative Work.

*Conducted by* PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

## FAVORS FEDERAL-AID IDEA FOR RESEARCH

### Dr. W. R. Whitney of the General Electric Research Laboratory Says Federal Support Would Encourage More Research

"Federal support of engineering and scientific research in American colleges has interested me for several years," says Dr. W. R. Whitney of the research laboratory of the General Electric Company. "I want to aid in its development. I think I can see better than most people about how we stand and what we need. Any attempt to advance the stand of scientific work of the country should include all the generally productive sciences.

"Any original worker in research will appreciate how hard it is for men who have the natural gift of investigation to obtain that support and encouragement which would yield to the country the greatest return for their work. Talented investigators have been forced to combine valuable research work with executive or routine university duties and the editorship of journals. It ought to be possible for this country to support gifted researchers with just that natural amount of teaching which their development and the need for passing along to others their new work dictate.

"For our young men we must make our colleges as serviceable as any in the world. In order to complete his course or to acquire some experience in scientific experimental work, the student must not be forced to go abroad. We must arrange for the development, in widely separated parts of the country, of scientific specialists like those for whom many European cities have been famed.

"In foreign countries the research work of the teachers and their coterie of students rapidly advanced the industrial activities and broadened the horizon of the people. We ought to do as well here. Our colleges have always been forced to the limit in teaching the elements to large numbers of students, and there were no funds or teachers available for advanced scientific or research work. Many of those who became teachers because of their interest in scientific truth were soon prevented by this circumstance from developing those natural abilities which they may have had. Heretofore American genius or originality has too often been exposed in the Patent Office as devoid of experience and knowledge, or it has been forced to the ground after vainly trying to get aloft through advanced study and experiment and has had to devote ten hours a day to teaching elementary matters to large classes. The disadvantage of this system has long been recognized. The method of federal support has been well tested in Europe. Those men who rapidly developed ability in special scientific lines were freed from much of the work which less gifted men could do as well, and opportunity was given to them to carry on advanced research work and to develop at the same time the spirit of investigation in the minds of many of the abler students.

"President Maclaurin of the Massachusetts Institute of Technology has recently accepted the chairmanship of the national committee for the support of the Smith-Howard bill. This bill is intended to insure support by federal aid for scientific research in each state. It involves a small amount the first year ($15,000 per state), but this seems right, for it lessens the danger from what is usually, but improperly, called politics."

## Research in Progress or Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Technical Theory and Practice" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

### HEATING OF HOUSES BY ELECTRICITY.

Experiments were made on heating six adjacent houses by air heated by electricity. Each house was arranged with ducts in the walls and registers in each room as for ordinary hot-air heating. A central heating plant was installed, consisting of two iron boxes containing heating elements that could be connected to a 550-volt, three-phase circuit. Arrangements for a wide range of heat variation were provided. One end of these boxes was connected with a long duct, which in turn connected with the heating ducts of the various houses. At the other end of each box was a motor-driven fan capable of forcing 2000 cu. ft. of free air per minute through the heaters into the houses. The following table gives the results of these tests, the average internal temperature of the houses having been maintained at 70.3 deg. Fahr. In computing the watts per cubic foot the volumes of basements and attics were disregarded:

| Temp. (Fahr.) of Outside Air | Heating Temp. (Fahr.) | Watts per Cu.Ft. of Heated Space |
|---|---|---|
| —28 | 98 | 1.63 |
| — 9 | 79 | 1.27 |
| +10 | 60 | 0.93 |

*—E. R. Shirley, Peterborough, Ontario.*

## Apparatus Available

### VECTROMETER.

In solving alternating-current problems by means of complex quantities two forms are used, namely, $a+jb$ and $Ae^{j\theta}$. The first form is preferable for addition and subtraction, the second for multiplication and division. In many problems it is necessary to change from one form to the other, and to facilitate such changes a simple device has been constructed which, in principle, is a universal right-angle triangle. Knowing the two sides $a$ and $b$, the hypotenuse $A$ and the angle $\theta$ can be read off, and vice versa. The device saves considerable time in computations involving complex quantities.—*V. Karapetoff, Cornell University, Ithaca, N. Y.*

## Suggestions for Research

### HOIST.

It is desired to develop a 60-cycle, single-phase motor and control suitable for a small hoist, say 1 hp. to 2 hp. The motor must have the characteristics of a series-wound machine and stand the severe service of frequent starting and stopping. Such a hoist, if supplied with power from city mains, would be a great convenience for hardware and other stores which handle heavy materials.

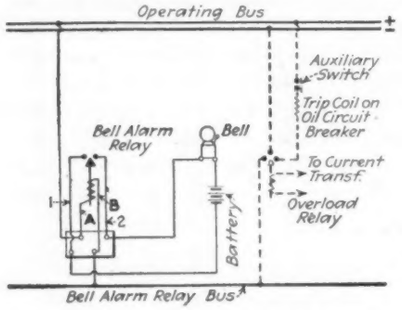
### SYNCHRONOUS CONDENSER, OSCILLATING TYPE.

Some years ago P. Boucherot suggested and built a synchronous condenser (oscilla) in which the direct-current exciting field oscillated synchronously in front of the armature instead of rotating (*Bulletin* of the Société Internationale des Electriciens, 1908, p. 731). The necessary elasticity of the oscillating system is either provided by means of springs or the magnetic circuit itself is made of elastic steel sheets. When overexcited such an oscilla takes in a leading current and may therefore be used for correcting the power factor of a circuit. Ordinary electrostatic condensers have been recently proposed and used for compensating the lagging current in moderate-size city installations, and it would be of interest to compare their size, cost and weight with that of an oscilla designed with all the modern experience, with forced ventilation, and with high specific electric and magnetic loading of the materials. The oscilla has an advantage over an ordinary synchronous motor in that it has no shaft and no bearings to be looked after and may be designed for kilovolt-ampere outputs for which static condensers would be prohibitive.—*Editorial Suggestion.*

## Bell-Alarm Relay Switches

*To the Editor of* ELECTRICAL WORLD:

SIR: In the Nov. 9 issue of the ELECTRICAL WORLD appears an article on "Safety Features in Switchboard Installations," with particular reference to alarm systems. The authors have criticised some of the existing methods and have suggested other means of accomplishing the desired




BELL-ALARM SIGNAL CIRCUIT INDEPENDENT OF CIRCUIT-BREAKER TRIP COILS

results. While the schemes suggested by the authors are operative, there are others which are less expensive and also better electrically and mechanically.

The authors have outlined the existing method for bell alarm where air circuit breakers have lever switches in series with them, this scheme utilizing a circuit-closing auxiliary switch on the air circuit breaker and a circuit-opening auxiliary switch on the lever switch. Where air circuit breakers alone are used on circuits without lever switches in series, the authors, in order to effect an automatic resetting of the bell circuit, suggest the use of a double-pole auxiliary switch, circuit-closing and circuit-opening, and in addition a three-way snap or push switch for each circuit breaker. With this arrangement the resetting of the bell circuit is not automatic.

The authors have evidently overlooked the fact that there is on the market a circuit-closing bell-alarm switch for use on air circuit breakers which closes the bell circuit when the breakers open, which can be opened by hand, stopping the ringing of the bell, and which is automatically reset when the breaker is closed. Such a switch appears to be more desirable than the combination suggested by the authors.

The authors have described the very common scheme of using a hand-reset bell-alarm relay operated through the contacts of the protective relays and a relay bus to ring a bell. It is pointed out that with this scheme every trip coil on the various breakers is in series with the one-bell-alarm relay coil.

The authors have suggested the use of a passing contact auxiliary switch on the circuit breaker, closing only during a short period sufficient to energize a bell-alarm relay, the contacts of which would stay closed until the operator reset it by hand. Operators or manufacturers who have had experience with passing contact auxiliary switches are likely to object to this scheme, which is quite expensive and mechanically a rather difficult and troublesome proposition.

The bell-alarm relays on the market are of very substantial construction and have given no trouble. However, if there is an objection to this scheme, it is a very simple matter to provide the protective relay on the circuit with two-circuit contacts and operate the coil of the bell-alarm relay entirely independently of the trip coils of the circuit breaker. This scheme has frequently been used and is shown on the drawings inclosed. The two schemes described seem to be better and less expensive than those suggested by the author.

E. H. BECKERT.

Switchboard Department, General Electric Company, Schenectady, N. Y.

# *Readers' Views and Comments*

## Senator Weeks Explains His Reconstruction Measure

*To the Editor of* ELECTRICAL WORLD:

SIR: I note in the issue of the ELECTRICAL WORLD of Nov. 2 an article written by Wingrove Bathon relating to the two propositions pending to investigate and consider reconstruction measures. While it is true that the one I introduced did not stipulate that the commissions should be made up very largely of business men, that was the purpose of the plan proposed, and it was so stated in a speech I made at the time I introduced the resolution. Of course, it would be physically impossible for twelve men to investigate any considerable part of the activities which must be given consideration, and my intention was that each of the Congressional members should be the head of one of the twelve divisions into which I had divided the activities, and that he should associate with himself experts in such activities.

If Senator Overman's plan prevails, it would mean turning over to the bureau chiefs who happen to be in office in Washington these matters of great importance, and there would be no assurance that the plans developed by such an investigation would receive the approval of Congress; while if twelve members of Congress, holding leading positions, selected from both sides of both chambers, should agree on a recommendation, it would be almost certain to receive early and favorable consideration. It does not mean because members of Congress are to do this investigating that politics of any kind will become involved. It might, and yet not the slightest development of a political character has entered into some of the investigations which have been made by Congress during the last ten years. I think a further examination of the Overman plan as compared with mine will demonstrate that on the whole my proposition would be much more likely to bring about speedy and wise results.

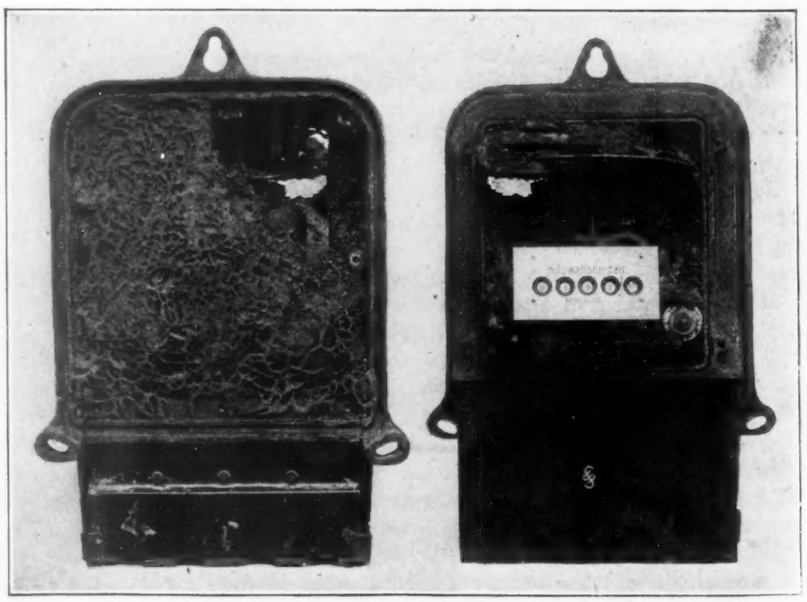
JOHN W. WEEKS.

Senate Chamber, Washington.

## Meter Attacked by White Ants

*To the Editor of* ELECTRICAL WORLD:

SIR: The two accompanying illustrations of one of our service meters may be of interest to you. The meter has been attacked by white ants. Our meters are read monthly and evidently in this case the insects have done their job within this period. They fill the meter up with earth and deposit, entering through the cover packing which they eat away. They strip the meter of every bit of insulation, leaving only the bare copper and iron.



SIAM ELECTRICITY COMPANY, LTD.

Bangkok, Siam.

# NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

## INTERNATIONAL TRADE MEETING IN NEW YORK

### Committee of the Associated Manufacturers of Electrical Supplies Works on Problems Connected with Upbuilding of Foreign Business

A meeting of the international trade committee of the Associated Manufacturers of Electrical Supplies was held at the association headquarters, New York, on Dec. 11.

Much discussion took place on "standardization in exports," centering on the suggestion of a recognized standardization of material under some code in foreign countries similar to the National Electrical Code here. It was decided that the matter should be investigated further and receive consideration at the next meeting of the committee with suggestions as to the best course to be followed under existing conditions.

William Burgess, adviser to the committee, reported that several members of the committee and he had worked on the classification schedule, including apparatus as well as supplies. Conferences were held also, he said, with members of the Electric Power Club in regard to the classification. A tentative schedule was agreed upon for consideration by the Electric Power Club and for such final action as may be decided to be the best course to obtain satisfactory results. Copies of the parts of the schedule in which they are specially interested will be sent to those who are following the work of the committee.

The next meeting will be held on Jan. 16.

## STILL NO REPORT UPON WATER-POWER MEASURE

### Senate and House Conferees Unable to Advance Bill Owing to the Absence of Leading Committee Members—Goes Over Till Next Year

An agreement has been reached between the conferees of the House and the Senate who are in charge of the water-power bills now pending in Congress to take no action in conference until after the first of the year.

Only one meeting of the conferees on the water-power bills has been held since the election in November. This took place a few days ago, but two of the principal members of the conference—namely, Senator Shields and Representative Ferris—were absent and their colleagues agreed not to proceed until they can be present. Senator Shields is confined to his home in Tennessee by illness. At the meeting of some of the conferees a few days ago, it is reported by the Washington correspondent of the ELECTRICAL WORLD, Judge Sims, chairman of the House conferees, again strongly urged that action be taken by the conference so that its report may be brought before the House and Senate as soon as possible, especially as it is expected there will be extended debate on the report in both houses as soon as it is brought in. But Judge Sims, who has labored long and assiduously in behalf of water-power legislation, was unable to do more at the meeting than again call the attention of the conferees to the importance of the proposed measure.

## CONVENTION OF THE DOHERTY ORGANIZATION

### Meeting in New York of Representatives of the Properties Brings Out Points on Training, Lost Electrical Energy, Safety and New Business

A convention of the Doherty Organization was held in New York last week. From 250 to 300 attended the various sessions and the banquet, which was held at the Hotel Waldorf-Astoria on the evening of Dec. 12 and at which Henry L. Doherty and others connected with the organization spoke.

Dr. Howard B. Shaw, in discussing the training schools, said in part: "In training technical men I believe we should first train them to be practical, and I also feel that the practical men should be teamed to benefit by technique. The graduates of technical schools are generally well grounded in the theory and have some hearsay about practice in one line of engineering, but few of them know organization team work or business except as they have got some of it incidentally. I take it that we need, and will continue to need, in increasing numbers men in all phases of the business in the organization—not only managers and executives, but in larger measure operators and engineers, men to get new business, men to see that renewals are collected and men to do all the various tasks."

At a meeting of the public utility section, lost and unaccounted-for electrical energy was first taken up in conjunction with the problem of keeping meters in shape.

Fred C. Pratt, of the engineering department of the New York office, in telling of electric energy losses in the Doherty Organization for the twelve months ended October, 1918, said that while the generation had been 640,000,000 kw.-hr., the losses had been 95,000,000 kw.-hr., the recovery being 85 per cent. He thought that losses were divided into the legitimate and the others, and that there should be some determination as to what proper losses should amount to. He saw great possibilities of saving through frequent meter tests.

George E. Hayler, Jr., gave it as his opinion that

the average meter department was not fitted to handle large power business. The power meter, he said, certainly needs attention as the possibilities of losing a large amount of electric energy are always to be reckoned with.

R. L. Baker, engineer for electric operations of the Doherty Organization, asked if the managers would favor having a separate department for meter testing under Mr. Pratt, which probably would include a school for metermen and repairmen. The vote was almost unanimously affirmative. T. O. Kennedy, general superintendent of the Denver Gas & Electric Light Company, stated that that concern had suffered largely through theft of energy, but that enough of the lost energy had been located to pay for the cost of the investigation.

### PROMOTING SAFETY IN THE ORGANIZATION

George Oliver Smith, commissioner of safety of the organization, produced some interesting figures to prove the value of that work. In considering safety work from the cash standpoint alone he cited an example of one company which had saved $60,000 during the last year. He admitted that the number of accidents in all companies of the organization had shown an increased total during the war period because of the abnormal conditions. Taking the Doherty public utilities as a group, a decrease in accidents of 18 per cent was shown in the last year as against the previous twelve months. At the same time the days of lost time were reduced 17 per cent, which would probably mean a net saving in money of about $4,800 a year. Mr. Smith cited one company that in four years had doubled its gross earnings yet showed a decrease in the amount of accident claims.

The new-business section discussed at great length putting fitting departments under the control of new-business departments. This resulted in the appointment of a committee to consider the matter, consisting of S. C. Irby, Hattiesburg, chairman; B. H. Jardine, Knoxville; C. N. Stannard, Denver; R. E. Landers, Tonawanda, and Luther Gaston, Spokane. All the new-business managers recorded themselves as against continuation of the loaned appliance account. The meeting also decided in favor of having one or two available new-business substitutes in each company for emergency work.

THE ELECTRICAL WORLD

STREET-LIGHTING TABLES

FOR 1919

Following its practice for thirty consecutive years, the ELECTRICAL WORLD has prepared tables showing the proper time for lighting and extinguishing street lamps. The 1919 tables are now ready, and a copy will be sent free to any reader upon request to the ELECTRICAL WORLD, Tenth Avenue at Thirty-sixth Street, New York. For more than one copy a charge of 10 cents per copy is made.

## NEW BELL SYSTEM OF MULTIPLEX TELEPHONY

### Theodore N. Vail Announces Result of Work of Technical Staff Which Will Increase Manyfold the Capacity of Long Wires

In a letter to Postmaster-General Burleson Theodore N. Vail, president American Telephone & Telegraph Company, announces the most recent practical application of the work of the technical staff of the Bell system. After several years of intense effort they have invented and developed a practical system of multiplex telephony and telegraphy by the use of which it is now possible to increase manyfold the message-carrying capacity of long telephone and telegraph wires, especially of the open-wire type.

An installation of the multiplex telephone system, Mr. Vail says, has been made between Baltimore and Pittsburgh and has been in service for more than a month. Mr. Vail says in part:

With this new system four telephone conversations over one pair of wires are simultaneously carried on, in addition to the telephone conversation provided by the ordinary methods. Thus, over a single pair of wires a total of five telephone conversations are simultaneously operated, each giving service as good as that provided by the circuit working in the ordinary way.

Heretofore the best telephone methods known to the art provided only one telephone conversation at a time over a single pair of wires. A number of years ago we developed the "phantom circuit" arrangement by which three telephone circuits are obtained from two pairs of wires, an important improvement of which we have made extensive use. Now by our multiplex method we are enabled to obtain five telephone circuits over one pair of wires; that is, ten simultaneous telephone conversations from the two pairs of wires, which formerly could be used for only three simultaneous telephone conversations. This represents an increase of more than threefold in the telephonic capacity of the wires as compared with the best previous state of the art and a fivefold increase under conditions where the phantom circuit is not employed.

In telegraphy as well as in telephony sensational results have been attained by the new system. By combining two telegraph wires into a metallic circuit of the type used for telephone working and by applying our new apparatus and methods to this metallic circuit we have enormously increased the capacity of the wires for telegraphic messages. As applied to high-speed printer systems we can do eight times as much as is now done, and as compared with the ordinary duplex telegraph circuit in general use we can do ten times as much. These increased results are attained without in any way impairing the quality of telegraph working.

The nature of these developments is such that if desired wires may be used partly for telephone and partly for telegraph. A pair of wires is available either for five simultaneous telephone conversations or for forty simultaneous telegraph messages, or partly for one and partly for the other.

While giving the credit of the new developments to the technical staff of the Bell system acting as an organization, Mr. Vail mentions particularly the work of O. B. Blackwell, G. A. Campbell, H. S. Osborne, J. R. Carson, Lloyd Espenschied, H. A. Affel and John Davidson, Jr., of the engineering department of the American Telephone & Telegraph Company, and E. H. Colpitts, H. D. Arnold, B. W. Kendall, R. A. Heising, H. J. Vennes, E. O. Scriven and H. F. Kortheuer of the engineering department of the Western Electric Company, the manufacturing division of the Bell system.

# Development of Research a Vital Necessity

## A. I. E. E. Speakers Insist that Industrial Supremacy Cannot Be Maintained by Any Nation Unless It Rests on a Foundation of Scientific Progress—Universities Should Have Responsibility of Training the Investigators

THE time is ripe for launching a movement to improve or make over our research agencies so that they may take a responsible part in the industrial life of the nation. The war has given us a broader view of the part this country should take in its industrial and commercial relations with the other nations of the world, and our experience has been such that revolutionary changes impossible five years ago may now receive practical consideration. Both Dr. W. R. Whitney and Col. R. A. Millikan, who addressed the three hundred and forty-second meeting of the American Institute of Electrical Engineers at Philadelphia on Dec. 13, insisted that the universities of the country should have the responsibility of developing research men. They said that the greatest need at this time is not laboratories or apparatus but men trained to carry out systematic scientific development work.

### NEED FOR ENGINEERING RESEARCH

Dr. Whitney called attention to the need for greater efforts to develop research work and workers in his paper entitled "American Engineering Research." "We have been so keen in engineering that American engineering is unsurpassed in the world," said Dr. Whitney, "but we never made a fair start in American engineering research. Moreover, we have no plan for producing research men, though we have plenty of plans for consuming them. We are inclined to be so elated by our apparent successes in industry that we imagine that there is some way to build without foundation, to practice without experience, to reap where we have never sown."

Before we can expect to take our place as a first-class nation in scientific achievement some comprehensive plan for the training of research men must be devised. Dr. Whitney believes our present institutions of higher education should undertake this work. He said: "Now there is one defect in this system of rapid utilization of our resources. It does not produce any new material, though it may organize the old. We needed organized engineering research long before the war; we needed it more during the war, and we shall certainly need it after the war. It is the duty of engineers to study this matter and take active steps to correct it. The problem is, how shall we insure the preparation of plenty of American men of science by some system which will make us independent of foreign assistance? My belief is that it can well be done in our existing colleges by greater attention to new material truth. Experimental work in the sciences best prepares and preserves those desirable qualities in teachers, interest and enthusiasm. Any plan which would insure properly supported investigators whose vocation was experiment and whose avocation was teaching, where students could *work* with them, would be a most natural development. It is a way already thoroughly tested abroad and would be a step of the greatest value to this country."

In describing the system of education abroad, where research in the pure sciences has been encouraged to the unmeasurable advantage of those nations where it has been fostered, Dr. Whitney spoke as follows:

"They were the result of a policy almost identical in all cases. Each was freed by some planned system to evolve himself and follow his studies along the lines he chose, and he was given the assistance of students who were at the same time learning the value and rare power of careful thought and painstaking investigation. They created atmospheres of scientific pioneering. The teacher was the leader. He was exploring. His interest was transferred to others by that most direct way —close contact. The lines of scientific endeavor were not chosen by some remote director or committee of experiment, but the subject itself led the investigator along, and new truth was the sole aim. The professor then became the leader in the university, because he was following a new line of action and not because, at the request of a faculty committee, he was perhaps trying to solve some particular indigenous problem or reducing the cost of some existing factory product. He was being led by Nature, instead of trying, as our industrial laboratories so often do, to force Nature along lines which we think most desirable.

"Some one has suggested that possibly our industrial research laboratories could supply the country's deficiency of scientific research and its teaching. Many industrial laboratories have been established recently, but, to my mind, there does not seem the slightest possibility of thus meeting the real need of the country. It is neither natural nor desirable, and most recent writers on the subject have been clear on this point."

Of our own needs Dr. Whitney said: "Central bureaus of science and research have been repeatedly advocated and many are still being planned. None of these is probably perfect. Most of them would consume (possibly ossify), but not produce, men. Perhaps all of them should be studied by engineers and some of them developed, but if many were carried out, it would immediately become evident that our crying need is for general college research work, to prepare trained investigators."

At the present time the colleges are occupied with giving a limited training to a large number of students, and it is well understood that the support of these institutions is generally insufficient to maintain the necessary instructional staff for a broad system of training a great number of men for advanced research work. The Smith-Howard bill, now pending in Congress, seems to be the most satisfactory suggestion yet made, though it provides only enough funds to fairly start the work, $15,000 per year for a college in each state.

### PUBLIC SHOULD APPRECIATE SCIENTIFIC WORK

In discussing his subject, "Research in America After the War," Colonel Millikan also voiced the opinion that the colleges comprise the best agency through which to develop "researchers," but he says that much educa-

tional effort will be necessary to gain public support for this work. "What we need," he declared "is, first, the development of men, of more trained men than we have. We have not anything like the number that corresponds to our population. Next we need the development of a public opinion in the United States, and an appreciation of what science is and what it can do. We need a better educated, scientific intelligence than we have at the present time."

Colonel Millikan said that the day of the individual research worker is past, as shown by our experience in the war. Great numbers of trained men will hereafter be used for organized research.

"If there is anything that has been demonstrated by the experiences not only of America but of all other countries in this war, every one of the Allied countries, of the major belligerents, at any rate," he said, "it is that you cannot depend upon the so-called undirected inventive genius of a people to get results. You have got to get results by getting trained groups of competent men on the problems. In other words, you get results by the strict scientific method, the engineering method, of approach.

"You have had in every one of the major belligerent countries your boards of inventions, and they will all tell you, every one of them—Italy, France, England and the United States—that not one suggestion in more than ten thousand is any good that comes in that way, and that ninety-nine out of a hundred of those that are good have already been thought of and worked upon by the groups of trained men who have been giving their attention and skill to these research matters.

"I would not cast any dampness over the luster of names like Franklin and Henry and men of that type whom we produced before that time," Colonel Millikan went on, "but, after all, these were individual geniuses, and we have passed from the stage when you can depend on individual geniuses for advancing the wheels of progress. If you want to do it rapidly, you have got to do in peace exactly as we did in war. You have got to call together your groups of research men in your industries, in centers—I do not care where—and give them the problems, and let them push the thing forward, because they will do it, and they will do it ten times as fast—yes, a hundred times as fast—as your wheels will move if you depend on the exceptional inventive genius of the country."

### The Smith-Howard Bill

In speaking of amendments to the Smith-Howard bill effected through the advice of the National Research Council, Colonel Millikan said:

"These types of modifications are these—and these seem to be the essence of the whole thing—if you are going to stimulate research, if your motive is to stimulate research in the United States, as much as you can, instead of allotting funds to any particular institutions, which will become a part of the budget of these institutions, the suggestion was that the federal government allot these funds in each state to a board, composed of at least five of the most eminent scientists and engineers inside the state, for distribution to the educational institutions inside the state upon the basis of programs of research submitted annually by these institutions to the central board.

"Now, if you can get the allotment of research funds to men who know what research is and get that kind of rivalry between institutions, you are going to develop the atmosphere of research in many institutions throughout the country, and you will never, in any way, be able to develop research men except by creating that kind of an atmosphere, and you must have in every institution where men are going to be developed men who are creating this atmosphere and devoting most of their time to it, and that kind of a scheme makes it possible to plant men all over the country. I think with that kind of a scheme you can get a stimulation of research throughout the country in industrial lines and pure science lines much better than by any other scheme I have seen discussed at any time."

Colonel Millikan then outlined proposed changes in the organization of the National Research Council to convert that body from a war to a peace footing. He predicted that if the Smith-Howard bill did not pass, the National Research Council would attempt to get funds for the development of research work in the various states. Another possible source of support is indicated as follows: "I look for the establishment by philanthropists of research professorships. Funds that are donated to colleges and universities for research work must be devoted by the terms of gift to research purposes and cannot be put into a merely educational budget, and the National Research Council has had at the start as one of its chief aims to stimulate that sort of thing. But I agree with Dr. Whitney that in a country like this there is no reason whatever why the federal government should not get behind the development of research just as well as, and in addition to, private enterprises."

### Electric Power in Anthracite Mines

The technical session was devoted to two papers on electric drive in the coal-mining industry, namely, "The Use of Electric Power in the Mining of Anthracite Coal," by J. B. Crane, and "Drum Shapes as Affecting the Mine-Hoist Duty Cycle and Motor Rating," by F. L. Stone.

Based upon the experience in mines coming under his observation, Mr. Crane estimated that the output of the anthracite mines could have been increased by 10,000,000 tons by the general use of electric drive. He stated that the average expenditure of energy in mining a ton of anthracite coal is 12 kw.-hr., whereas the average required per ton of bituminous coal, as shown by the records in fifty mines, is 3.57 kw.-hr. This discrepancy is accounted for by the much greater depth of the anthracite mines, which vary from 300 ft. to 1000 ft. (90 m. to 300 m.), thus taking more energy for hoisting coal and pumping water, and by the heavier duty put on breaker motors. In the case of steam-engine drive as much as 400 tons of coal has been required for the mining of 1000 tons, and the speaker pointed out that in 1917 electric drive in the anthracite mines would have resulted in the production of 8,000,000 tons more than was mined and the saving of 2½ per cent in man power would have released men enough to mine 2,000,000 tons, making the probable added production of anthracite coal by the use of electrical energy about 100,000,000 tons in 1917. From the central-station operator's point of view this would be a very desirable load,

and, according to Mr. Crane's estimate, the business could be made to yield an income of 38 per cent on the investment.

### HOISTING DRUMS OF CONICAL SHAPE

Taking the case of coal mines from 300 ft. to 500 ft. (90 m. to 150 m.) deep, Mr. Stone showed that by using a lower speed to which the hoisting motors must accelerate the load in starting smaller motors could be used. This can also be accomplished without slowing down the output of the mine by so shaping the hoisting drum that the speed of the load increases after the driving motor has reached normal speed. Cases were worked out showing the improved duty cycle obtained by using conical drums and also combination cylindrical and conical drums. It was pointed out in the discussion that the cylindrical drums are lighter than those investigated by Mr. Stone and that conical drums entail greater wear on the ropes.

## WILL NOT INTERCONNECT SPRINGFIELD (ILL.) PLANTS

### Controversy Between Officials of the City and the Fuel Administration Is Brought to an End Without a Decision Having Been Reached

The signing of the armistice terminated a decidedly tense situation which had arisen between the United States Fuel Administration and city officials of Springfield, Ill., and brought to an end repeated efforts that had been made by representatives of the Fuel Administration to interconnect the Springfield municipal light plant with the central station of the Springfield Gas & Electric Company.

In June last the federal administration commenced an investigation to find out which of the two plants temporarily could discontinue with the larger saving of fuel. The fact that the business center and a considerable portion of the residential section of Springfield obtain steam and hot-water heat from the company's central station, coupled with the fact that over 17,000,000 kw.-hr. are delivered each year by that station as against some 2,500,000 kw.-hr. by the city plant, the major portion of which is for street lighting and other municipal purposes, rendered it certain that if there were to be any discontinuance it must be by the municipal plant.

After considerable correspondence between the Fuel Administration and the managements of the two plants Joseph W. Harrington, administrative engineer of the Fuel Administration, visited Springfield and made a detailed investigation. He made the recommendation that the plants be interconnected, stating that, on a conservative estimate, between 4000 tons and 5000 tons of coal would be saved. The only investment required would be the copper wire on pole stations already built between the company's power house and the city's substation, five blocks distant. The company agreed to make the extension and, subject to the approval of the state public utilities commission, to carry the added load at the present cost to the municipal plant, such cost to be determined by the engineers of the Fuel Administration.

On the investigation made by Mr. Harrington and other representatives of the Fuel Administration, Harold Almert of Chicago, federal Director of Conservation, recommended that steps to bring about the proposed interconnection be taken without delay and suggested that a meeting be held between representatives of the Fuel Administration, the city and the central-station company. Manager Mackie acquiesced in the suggestion for such a meeting, but the Mayor stated that he would not call such meeting until consultation with the city's advisory engineer. The identity of the latter was not stated, but he was understood to be E. W. Bemis of Chicago.

The meeting was never called. Instead, Commissioner Spaulding, who has charge of the combined municipal water and light plants, issued a long statement to the daily newspapers declaring that there was "a plot on foot" between the federal Fuel Administration and the company "to swallow up the municipal light plant." Mr. Spaulding declared that there would be no saving in such interconnection as there would be an increase in coal consumption to pump the city's water if the electric load were taken away from the municipal plant. The city commissioner has contended for several years that the municipal light plant is operated by "surplus current" from the waterworks.

Asserting that the statements of the federal Fuel Administration's representatives were wrong, the municipal authorities appealed to Dr. Garfield, and the latter interposed an order that there should be no closing of the plant without instructions from him. The armistice brought the matter to a conclusion.

## QUARTERLY CONFERENCE OF SOUTHWESTERN ASSOCIATION

### Fuel, Labor and Rates Are Discussed at the Gathering at Houston, Tex., and the Date for the Annual Convention Is Fixed

The second quarterly conference of the Southwestern Electrical & Gas Association was held at the Bender Hotel, Houston, Tex., on Dec. 9. Two sessions were held, morning and afternoon, with a luncheon intervening, the luncheon being given by the association as a compliment to all attending. Executive representatives of all the larger utilities and groups of utilities in Texas were present as well as those from the medium and smaller utilities, gas, electric light and power and street and interurban railways being all represented.

The topics discussed were the following:

Fuel—Its present and future problems in the Southwest, with especial reference to the continuance of a certain supply of fuel oil and natural gas and the probability of their replacement in the near future by Texas lignite.

Labor—The new conditions to be met during peace readjustment, with especial reference to the reëmployment of those former employees who left their positions to enter the government service. Under this head the topic of employees' benefit associations such as those to provide sickness and death insurance, coöperative buying, building and loan associations, etc., were discussed.

Rates and Fares—Their stabilizing and the standardization of their bases throughout Texas as a whole. The

best method of obtaining increases in rates and fares as derived from the actual experiences of those who have made such attempts was also discussed in an interesting manner.

In regard to fuel it was decided that, while the present supply of gas in the northern portion of the state and the present and future supply of Mexican oil and residuals in the Gulf Coast section show no sign of early diminution or increase in price, there is in the interior of the state a great need for a cheaper fuel and one whose continuity of supply for a long time in the future may be relied on. While Texas has within its state lines and lying contiguous to its principal fuel-using sections over 6,000,000,000 tons of lignite which can be cheaply mined and carried, the character of the raw lignite is such as to make it an inefficient and unsatisfactory substitute for coal, fuel oil or natural gas at the present time. It was shown, however, that the experiments now being made are virtually solving this question and that, by the "carbonization" of lignite, by changed methods of distilling it for gas and residuals, it could be made a very close competitor with all the other available fuels in efficiency, with the further vital requisite of an uninterrupted continuity of supply for a century or two in the future.

With reference to the problems of the employees returning from government service it was unanimously agreed that they would be immediately reinstated in their former positions where such positions had not been abolished under the exigencies of war times, and that under the latter condition other equal positions should be open to them, their seniority in service being preserved, and that in all cases preference would be given to those who returned maimed, wounded or in any way injured while serving their country in government service.

### STANDARDIZATION OF RATES AND FARES

The matter of the standardization of rate and fare bases throughout Texas was fully discussed, and action was taken to have the association office make this a matter of immediate action. Respecting the best method of obtaining increase of rates and fares, the consensus of opinion, based on the experiences of those who had made attempts of this kind with varying degrees of success, was that no hard-and-fast rule could be laid down to guide others in this matter, as each case presented such particularly local conditions as to make it a unit problem. The only point definitely settled was that both the public and its representatives should be approached on this matter with the utmost candor and that all statements made, data and figures offered and reasons adduced for the increase should be strictly true, proved and uncontrovertible.

At the subsequent meeting of the executive committee of the association it was decided that a convention of the association would be held at Galveston, Tex., between May 15 and June 10, 1919—the exact date to be determined after conference with other public utility organizations as to their proposed conventions so that there may be no conflict between dates either as to the national association or those of neighboring states. There will be no other "conference" of the association before the 1919 convention.

## CONSOLIDATION OF EASTERN NEW YORK UTILITIES PROPOSED

### Adirondack Electric Power Corporation Seeks Permission to Absorb Franchises and Property of Six Power Corporations

The Public Service Commission, Second District, New York, gave a hearing on Dec. 4 upon the proposed consolidation of hydroelectric and steam-power properties, estimated value $9,500,000, operating in the Mohawk Valley and the East Canada Creek watersheds with other hydroelectric properties in the upper Hudson Valley.

The formal hearing was upon the joint petition of the Adirondack Electric Power Corporation and the Schenectady Illuminating Company of Schenectady for authority to the Adirondack company to take over the property and franchises of the Schenectady Illuminating Company. The sale by the Schenectady Illuminating Company also involved the transfer to the Adirondack Electric Power Corporation of these corporations, to be acquired by the Schenectady Illuminating Company by merger: The Mohawk Gas Company, Schenectady; the Schenectady Power Company, operating a hydroelectric plant at Schaghticoke; the Edison Electric Light & Power Company of Amsterdam, and the East Creek Electric Light & Power Company, operating two hydroelectric plants on the East Canada Creek.

The Adirondack company also petitioned the commission for authority to issue $1,800,000 of 7 per cent preferred stock, $2,500,000 debenture bonds or preferred stock and a certain amount of two-year notes necessary to carry out the proposed purchase. Steps to bring about a unification of the corporate interests were first started about three years ago.

Francis E. Frothingham, chairman of the executive committee of the Adirondack Power Corporation, told the commission in detail about the unification of the power companies. He explained a map giving the sources of supply of the companies and the transmission systems which it is intended to hook up by consolidation. There was a transmission line from Spiers Falls and Mechanicsville to Glens Falls, Schenectady, Albany, Troy and intermediate towns and a line from the Hudson River plant to Amsterdam and then to Little Falls and Utica, electricity to be turned on in the section from Amsterdam west within a few weeks.

The Edison Electric company is connected with the East Creek company, which supplies the Mohawk Valley and operates cars from Amsterdam to Johnstown and Gloversville. Electricity is supplied to Albany and Troy, to the trolley lines in both cities, there is a general lighting and power business in Amsterdam, light and power in Schenectady for companies there, and from the Utica substation cars are operated from Little Falls to and in Utica and then west to Canastota, with transmission lines to Oneida and Canastota. The merger, Mr. Frothingham explained, will do away with duplication and waste and would result in a saving of between $400,000 and $500,000 in a year in coal.

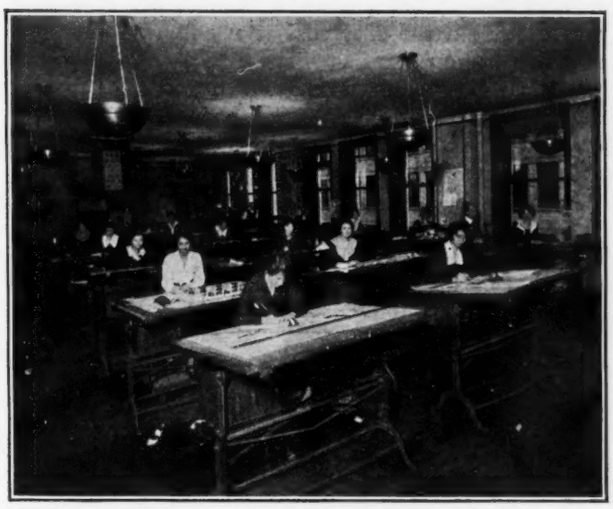
Mr. Frothingham said the company would secure continuation of steam-power service at Mechanicsville, Albany, Schenectady, Tribes Hill and Utica, where contractual relations exist in part. Under the consolidation a good twenty-four-hour service could be given.

## COMMONWEALTH EDISON'S RE-EMPLOYMENT POLICY

### Honorably Discharged Soldiers and Sailors to Be Taken Back Immediately—Success of Women in the Distribution Engineer's Office

The problem of man power in the office of the distribution engineers of the Commonwealth Edison Company, Chicago, was solved by employing girls who were or had been students at the Art Institute. Working from rough sketches, these girls produce finished tracings that are entirely satisfactory from both the electrical and the drafting standpoint. Incidentally it is such efficient and satisfactory women employees as these that present a part of the reconstruction problem. This is the way the Commonwealth Edison Company will solve that problem.

Former employees of the Commonwealth Edison Company who have left the company's service to enter the



WOMEN EMPLOYED IN DISTRIBUTION ENGINEER'S DEPARTMENT

service of the army or navy in this war, and who come directly to the company after honorable discharge from the United States military service and apply for reinstatement, are to be taken back into the company's service immediately. This is in brief the policy which the company has now adopted at the direction of President Samuel Insull. All heads of the departments and the employment bureau have been notified that this policy is now in effect, and they are already governing themselves in accordance with it.

The rule, as adopted by the advisory committee, states that these men will be reinstated in the same position if possible or in some other suitable position in the same department in which they were formerly employed, and that, if there are no vacancies in the position or department in which a man was formerly employed, then, wherever necessary, the employee now filling the position may be transferred to another department where his services can be utilized to make room for the returned soldier; and also that the present employees, if efficient, shall be retained in the service of the company, even if it is necessary to thus transfer them. This includes women.

Another point covered is that it is the company's intention not only to place the men returning from the military service of the United States in their former positions, but also that they shall be given the present rates of pay of the positions in which they are placed. This latter provision is a very important one in many cases, as will be understood when it is remembered that the scale of pay is now higher in general than it was in 1917.

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## SHORTAGE OF ELECTRICITY IN PHILADELPHIA EXPLAINED

### President McCall Issues a Statement Giving the Facts in the Case for the Information of the Company's Customers

A short while ago there was quite a controversy over the shortage of electric power in the Philadelphia district. It was maintained by the president of the local Chamber of Commerce, who also was appointed to make a power survey, that the Philadelphia Electric Company had actually a surplus of power instead of a shortage. Considering the restrictions imposed by the state fuel administrator to alleviate the power shortage, this statement, said to be based on a report reputed to have been made by Milo Maltbie, ex-public service commissioner of New York, naturally created a sensation among business men. Mr. McCall's statement dealing with the situation follows:

The trouble which developed in the big 35,000-kw. turbo-generator on Saturday, Nov. 9, and which caused the shutting down of that big unit for repairs, brought to a focus a situation which has existed for more than a year—namely, the lack of spare capacity with which to safeguard our service to the government and to the community.

This unfortunate condition has brought hardship to many of our customers and to the public generally. The fortunate fact that peace is assured alone prevents the danger which would have resulted if slowing down in war work in this district had come to be obligatory instead of desirable.

In the fog of controversy that has existed there are a few outstanding facts of importance: First, we knew that the excessive power demands for war work had deprived us of spare capacity essential for proper operation of this great property; second, we gave the most positive warning of this fact; third, we did all that was humanly possible to obtain the funds necessary to install capacity which we had been forehanded enough to order in advance; fourth, our budgets, prepared several years in advance and based on accurate estimates of the normal growth in our business, covered ample generating and distributing capacity for more than normal needs.

I am stating these facts to our customers, not because I desire controversy, but because I think they are entitled to the truth and because I feel keenly the responsibility resting upon a public utility company's personnel in the matter of furnishing adequate and efficient service to the community—a character of service which can be furnished only by wise forethought for the future and intelligent, unceasing endeavor all the time.

I think it due the organization of the Philadelphia Electric Company to call attention to the fact that, in spite of the great handicaps under which we have labored during the past twelve months, we have furnished a very high grade of service.

The generous coöperation which we have received from our customers during this critical period is a source of great gratification to us all and confirms my belief that the relationship between the Philadelphia Electric Company and its customers is of a more friendly nature than is usually found between a public utility company and the community which it serves. My belief that entire frankness upon mutually important topics is essential has prompted me to make the above statement.

## FUTURE MILITARY TRAINING OF STUDENTS DISCUSSED

### Experiment with Students' Army Training Corps Has Been Too Short to Justify Conclusions as to Its Value

At a convention of the Association of American Universities held at Boston on Dec. 5 a session was devoted to the consideration of "Problems Presented by the Students' Army Training Corps and the Future Military Training of Students." Brig.-Gen. Robert I. Rees, U. S. A., stated that at the time of the armistice 141,000 men were enrolled in 562 institutions, with an additional vocational detachment of 38,000. Four thousand officers were required to command this force. General Rees said that the response of the colleges to the S. A. T. C. program was most patriotic, and if the institutions had not rendered this service it would have been disastrous to the successful outcome of the war. The demand for supplies created by the offensive in France hampered the organization of the S. A. T. C., and the influenza epidemic was another adverse factor.

The cessation of hostilities destroyed the motive of the S. A. T. C., and has introduced much confusion into the colleges. The principal problem now, however, is to effect a settlement with the colleges which shall be financially equitable to them, and the War Department is at work on a settlement plan which it is hoped will lead to a satisfactory termination of the whole matter. The chief difficulty arises in connection with compensation for instruction, the questions of remuneration for subsistence, buildings, etc., being less troublesome.

A settlement bulletin is about to be issued by those in charge of the S. A. T. C. program. The War Department has just authorized the restoration of the Reserve Officers' Training Corps in institutions which voluntarily desire it. The equipment of the S. A. T. C. is to be utilized under the care of a responsible officer, pending the appointment of the R. O. T. C. command. General Rees said that a vast amount of data and information has been accumulated at Washington which the War Department plans to make available for the colleges, including both thesis and lecture material and embracing economics, production, transportation, sociology and almost every branch of educational training.

President Richard C. Maclaurin of the Massachusetts Institute of Technology reviewed the history of the S. A. T. C. development and said that the experiment was too short to justify conclusions as to its value. The difficulties arising from placing the students on active service, from dual control by the army and by the collegiate authorities, by the passage of the man-power bill and the program to have four or five million men in Europe by July 1, 1919, were formidable.

The process of induction was delayed by the failure of local boards to return the necessary papers quickly; the epidemic further complicated the situation; authority to spend money on publications was withheld until a time when most of the colleges expected to be well under way, and supplies were late in arriving. In spite of all the difficulties a self-sacrificing spirit was observed in all who directed this effort, and good intentions were manifested by practically all the army officers.

With time it appears that most of the difficulties would have been overcome. In future, except in case of actual war, there must be far greater freedom of academic control and far less military control, something more nearly approaching the system that has prevailed for over half a century in the land-grant colleges, with the possibility of a more intensive military training in camps during the summer. "The provision of work in summer camps would present some special difficulties to technical students," said Dr. Maclaurin, "but the problem of these students is special anyway and would call for special treatment. It should never be permitted to happen again that the country shall be called upon suddenly to provide a large army of technical experts for the needs of war. If we are optimistic enough to believe that war is to be abolished, then there is no problem for us to discuss to-day; but if war is to remain a possibility, we must face the fact that it would tend more and more to be a war of applied science, and the nation that does not take that lesson to heart by training man to apply science to warlike ends, should necessity demand such an application, would surely go down in the next great conflict."

In the discussion which followed there was general recognition of the importance of military training, arranged, however, to interfere as little as possible with a full academic program.

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## What Makes Water Power Costly

To increase the water supply in low-water periods the Western States Gas-Electric Company has created a new reservoir above its Placerville plant. This station has an available rating of about 4500 kw., but at low-water seasons not enough water is available to produce this energy. The engineers foresaw, however, that by creating pondage above the plant the period during which full rating would be available could be extended. Medley Lake was the site of one such pond. To build the several dams necessary to create the pondage was a more difficult task than it might appear. Medley Lake lies 8200 ft. above sea level. Snow always lies on the mountains around it. No roads reach it. The nearest highway at Echo Lake is 7 miles (11 km.) away. But in spite of these difficulties and by laborious painstaking methods there has been created an 8200-acre-foot (10,200,000-cu.m.) pondage. Needless to state the work has cost money. And this money must enter as a part of the capital charge of the hydroelectric plant and become a factor in the water-power rates.

## *Associations and Societies*

A complete Directory of Electrical Associations is printed in the first issue of each month.

**Canadian Electrical Association, Toronto Section.**—A program for the year was outlined at the meeting Nov. 7 of the Toronto Section, Canadian Electrical Association.

**The Electric Club of Chicago.**—At a meeting of the Electric Club of Chicago held Dec. 12 H. A. Porter, district manager Century Electric Company, was elected president and H. V. Coffy secretary.

**New York Jovian League.**—The annual meeting for electing officers and directors for the ensuing year will be held by the New York Jovian League at the Hotel McAlpin on Tuesday, Jan. 7, 1919, at 12.30 p.m.

**Electrical League of Cleveland.**—M. Luckiesh of the Nela Research Laboratory spoke at the regular Thursday noon meeting of the Electrical League of Cleveland on the subject "Five Thousand Miles in the Air."

**New York Electrical Society.**—On Thursday evening, Dec. 19, Ensign C. L. McCrea, U. S. N. R. F., gave an address before the New York Electrical Society on "The 14-in. Naval Railway Gun." The lecture was supplemented by moving pictures.

**A. S. M. E., Atlanta Section.**—At a recent meeting of the Atlanta Section, American Society of Mechanical Engineers, it was proposed to present a bill to the Georgia Legislature requiring the adoption of the A. S. M. E. boiler code for the State of Georgia.

**Electrical Estimators' Association.**—The Chicago Electrical Estimators' Association held a conference recently at which it invited the attendance of all electrical contractors in Chicago. The new estimating forms which the association has developed were explained by A. Uhl of the Henry Newguard Company.

**Western Society of Engineers.**—At the last meeting of the Western Society of Engineers, held in Chicago on Dec. 19, M. Luckiesh, chairman of the committee on camouflage of the National Research Council, gave an illustrated lecture on "Camouflage," with especial reference to marine and air service.

**San Francisco Electrical Development League.**—At the meeting on Dec. 2 Arthur D. Carvalho, president of Carvalho & Company, Hongkong, gave a talk on the electrical trade in the Orient. At the weekly luncheon of this league on Dec. 9 George B. McDougall, State Architect of California, spoke on "Construction Problems."

**N. E. L. A., Philadelphia Electric Company Section.** — The Christmas meeting of the Philadelphia Electric Company Section of the National Electric Light Association was held on the evening of Dec. 3, the speaker being Albert L. Moise, whose subject was "Reconstruction."

**Portland (Ore.) Sections, N. E. L. A. and A. I. E. E.**—At a joint meeting on Dec. 3 W. L. Morrison, manager and metallurgist of the Western Reduction Company, addressed the Portland Sections of the National Electric Light Association and the American Institute of Electrical Engineers on "Electric Smelting."

**Society of Automotive Engineers.**—The Society of Automotive Engineers will hold its winter meeting in New York, Jan. 12-14, 1919. The technical sessions will be devoted to war and post-war subjects, such as post-war automobiles, thermodynamics of internal-combustion engines, road tractors and commercial motor trucks.

**N. E. L. A., Philadelphia Section.**—William H. Berry, collector of the Port of Philadelphia, and his son, Major Benjamin S. Berry, of the United States Marines, spoke before a recent meeting of the Philadelphia Section, National Electric Light Association, Mr. Berry on war activities in this country and Major Berry on personal experience on the firing line.

**A. I. E. E., San Francisco Section.**—In San Francisco there has recently been established an "Engineers' Service Bureau" which is intended to serve as a clearing house (1) through which engineers in search of employment may get in touch with prospective employers and (2) through which employers may find technical men promptly as they are needed. This bureau is being conducted at the San Francisco Engineers' Club through the joint council of San Francisco engineering societies. In this organization are represented local sections of the American Society of Civil Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Institute of Mining Engineers and American Chemical Society.

**National Automotive Electric Service Association.**—The National Automotive Electric Service Association has been organized to promote and improve service on electrical equipment of automotive vehicles in the United States by coöperation between its members and others interested in the same line of business. The membership will be by firms rather than individuals, each one being entitled to two representatives with one vote for each. Any firm whose entire business or a fair proportion of whose business is devoted to service on the electrical equipment of automotive vehicles will be eligible to membership in this association. Officers elected were: President, Arthur Jones, president of the Arthur Jones Electric Company, Chicago; secretary, John W. Rusicka, manager Motor Electric Equipment Company.

## *Commission Rulings*

Important decisions of various state bodies involving or affecting electric light and power utilities.

**Extensions for Compliance with Safety Act.**— More time has been granted by the California Railroad Commission to the Coast Valleys Gas & Electric Company, the Sierra & San Francisco Power Company, the California-Oregon Power Company, the San José Railroads, the Peninsula Railway Company, the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation to comply with the provisions of the state law known as the safety act.

**Responsibility for Making Wiring Changes Is Placed on Customer.**—Maurice L. Rothschild, Chicago, recently complained as to the method of the demand measurement used by the Commonwealth Edison Company. The Edison company, through the installation of demand indicators of a type known as "M-2" and the institution of a clause in the rate schedule providing definitely for thirty-minute maximum demand, has changed from its former practice, in which a Wright instrument measured the maximum demand over a shorter period. The result of the change was to the consumer's advantage, since it reduced the maximum-demand measurement. It appears that the "M-2" type instrument is a type that must be associated with a single watt-hour meter for its proper operation, and to have initiated this type of demand measurement would have required the installation of five demand meters, one for each watt-hour meter. In the opinion of the respondent company this would have incurred an unwarranted expense, and it averred that if the complainant wished to avail itself of the advantages of the new measurement, it would be necessary that the services be combined at one point, so that one watt-hour meter might measure all energy furnished under the contract. The complainant did not so combine its wiring until November, 1917. It then sought reparation for the difference in bills rendered in the period 1915 to 1917, when the demand was measured by the Wright instrument. The Illinois Public Utilities Commission held in its opinion that the defendant company, through notification to the consumer of the possibility of the saving, fulfilled its obligation at least for a reasonable period of time, and any loss which the consumer experienced on account of failure to make necessary changes could not be caused by negligence of the defendant company. The Public Utilities Commission therefore dismissed the complaint.

## Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

**City of Cleveland Appeals.**—The city of Cleveland has carried its 3-cent rate case to the Ohio Supreme Court. Recently the Public Utilities Commission issued a ruling to the effect that 10 cents per kilowatt-hour shall be the maximum rate, with a sliding scale below this rate after a certain number of units have been used. The city has taken an appeal from this order, and twenty alleged errors have been cited to form a foundation for its case.

**International Power Economy Conference.**—At a meeting held at the City Club, Chicago, at which the principal manufacturers of power plant equipment were represented by delegates or proxies, a resolution favoring the continuation by the United States Bureau of Mines of the work of the National Fuel Administration was unanimously adopted and it was further resolved that the executive committee be instructed to communicate with the Director of the Bureau of Mines advising him of this organization of power plant equipment manufacturers and offering the assistance and coöperation of the association in his work of fuel conservation.

**Ohio Rate Ordinance Upheld.**—The Ohio Supreme Court last week reversed the Public Utilities Commission in an appeal from a rate order made by the city of Washington C. H. It seems that the Washington Gas & Electric Company had been operating several years when in January, 1914, it filed its schedule of rates with the Public Utilities Commission. The city had enacted an ordinance the previous year with the terms of which the company had complied, although it had not formally accepted it. On Jan. 15, 1918, a new schedule was filed with the commission and allowed. From this the appeal was taken. The court ruled that the actual acceptance of the ordinance was in effect the legal acceptance and that the rates may be modified only at the time the original ordinance expires.

**Accident in Defiance, Ohio.**—A series of unfortunate incidents accompanied the installation of a new 2500-kw. turbine at the station of the Defiance (Ohio) Gas & Electric Company, one of the plants controlled by the Auglaize Power Company, while at the same time a large unit was being installed at Maumee. It was thought that the Auglaize power dam would be able to carry the load while these installations were being made, but the water ran low and the load was thrown on the Maumee plant. There the transformer burned out. Another transformer sent from Bay City, Mich., suffered a like fate. As a last resort the big transformer at the Auglaize dam was torn out and sent to the Maumee plant, and after its installation Defiance, with a number of other towns, received light after being dark and without power for six days. The new turbine at the Defiance station was due to start on Dec. 14.

**Idaho Investigation of Electric Heating.**—On its own initiative the Idaho Public Utilities Commission is now investigating the feasibility of generation of electrical energy for heating purposes by large hydroelectric power plants in that state, thus assisting in solving the fuel problem. Some of the companies formerly tried to supply electric power for heating but abandoned the service, holding that it was not profitable or even feasible. It has since been claimed by others that with the vast amount of water power along the Snake River and its tributaries it is possible to furnish electric energy in such quantities that heating can be made not only feasible but profitable to the operating companies. At the first hearing the forty-three power companies represented held that heating by electricity is not physically or financially possible and that the contrary impression was due to misinformation sent broadcast. The cost of heating by electricity is five times the cost of heating by coal, it was contended. Electrification of railroads, it was held, is practicable and would do more to solve the coal question than anything else.

**Manufacturers Favor "Democracy of Commerce."**—At the annual convention of the American Manufacturers' Export Association, held shortly before the armistice was signed, the following resolution, moved by W. W. Nichols, was adopted: "Resolved, that in the midst of a war between democracy and autocracy the American Manufacturers' Export Association in convention assembled desires to place itself on record in favor of a democracy of commerce which signifies: A full condemnation of those methods of selfish indifference to the rights of others by which a blind autocracy precipitated a world war which cannot end until that autocracy is destroyed; a determined opposition to the Germanic system of insidious commercial propaganda which sought confidence only to destroy it and injected its poison into the commerce of every nation whose hospitality it enjoyed, and a decided stand upon the firm foundation of justice and fair dealing, in order that the foreign trade of the United States may enjoy that permanent prosperity which can be assured only by the respect and friendship of an enlightened world; and further resolved, that, in sympathy with these sentiments, Congress be urged to give careful attention to foreign trade measures already in the making in France, Great Britain and elsewhere and to encourage by its influence coöperation for commercial reciprocity."

## Recent Court Decisions

Findings of higher courts on legal cases involving electric light, power and other public utility companies.

**Contract for Public Lighting.**—Specific performance of a valid existing contract to do public commercial lighting in a city will be granted where damages are not an efficient or adequate remedy for loss due to breach, the Supreme Court of Wisconsin held in Oconto Electric Company versus City of Oconto (169 N. W. 293). A stipulation entered into before the railroad commission between plaintiff, having permit to do public lighting in city, and a rival company, being binding and in the nature of a contract, was held subject to enforcement. Where defendant city accepted benefits of that stipulation and the fruit of plaintiff's action, prosecuted in reliance thereon, it would be unconscionable to permit the city to repudiate plaintiff's established right, to which it cannot be restored and for which it cannot be awarded an adequate remedy at law. Injunction is the proper remedy for enforcing right of plaintiff public service corporation to do public commercial lighting in defendant city, the facts and circumstances presented tending to show an irreparable injury.

**Manufacturing Plant Selling Energy.**—A manufacturing concern doing public and commercial lighting without having been authorized so to do by its charter exercises such powers in violation of law, the Supreme Court of New York ruled (172 N. Y. S. 498). A corporation organizezd under the manufacturing corporations act of 1848, and not under the transportation corporations law, not having a franchise to use streets, highways and public places for purpose of furnishing electricity to inhabitants for light and power, has not acquired an implied franchise to use streets for such purpose by reason of long usage where such usage was in violation of law. The Public Service Commission, having authority to institute proceedings against an electric corporation doing anything in violation of law, may bring proceedings against a manufacturing concern not incorporated under the transportation corporations law that was using streets without having franchise to furnish electricity for light and power, where the furnishing of such electricity was in violation of the law, not being authorized by its charter. A manufacturing concern furnishing electricity to persons other than its tenants off its own premises for compensation, using public highways for such purposes, and operating an electric plant within the Public Service Commissions law defining "electric plant," is under the jurisdiction of the commission.

# *Men of the Industry*

Changes in Personnel and Position—Biographical Notes

**Franklin L. Hall,** formerly assistant secretary and auditor of the Narragansett Electric Lighting Company, Providence, R. I., has been recently elected secretary and treasurer of the company, succeeding the late William G. Nye.

**Arthur H. Kimball,** who recently retired from the managership of the Fall River (Mass.) Electric Light Company, is one of the best known central-station executives and engineers in New England. Mr. Kimball was one of the first central-station men in that section to appreciate the importance of improving the load factor through cultivation of power business and of the economic benefits of such business when maintained at rates responsive to local conditions. A native of Fitchburg, Mass., Mr. Kimball was educated in the local schools and entered the electrical field in 1881 as an employee of the Lowell District Telephone Company in Fitchburg. He was made manager of the

A. H. KIMBALL

company in 1883. From 1885 to 1886 he was engaged in the electrical contracting business at Fitchburg, becoming superintendent of the Wachusett Electric Light Company of that place in the latter year. In 1888 the property was purchased by the Fitchburg Gas Company, and the two companies were consolidated as the Fitchburg Gas & Electric Light Company. Mr. Kimball remained with the company until 1908, having full charge of the construction work and operations of the electrical department. He then became general manager of the Fall River company. During his incumbency the gross earnings of the company were increased from $227,000 to $632,026 per year and the output from 5,320,770 to 26,260,000 kw.-hr. Mr. Kimball was a pioneer in the application of central-station energy to textile mill driving. This class of load has been developed most successfully at Fall River under his direction. Mr. Kimball has been identified with the New England Section of the National Electric Light Association since its earliest days. His future plans look toward the establishment of a New England agency to distribute manufactured products of value to central stations and other engineering-industrial consumers. His present address is Newtonville, Mass.

**C. B. Mills** has resigned as mechanical engineer in charge of the industrial drafting department of the Westinghouse Electric & Manufacturing Company to become assistant chief engineer of the Sperry Gyroscope Company of Brooklyn.

**Frank G. Frost,** formerly superintendent of the Houston (Tex.) Lighting & Power Company, has been transferred by the United Gas & Electric Company to the New Orleans (La.) Railway & Lighting Company, as superintendent of power.

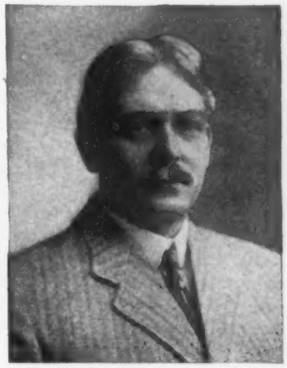
**Brigadier-General George H. Harries,** who in civilian life is a vice-president of H. M. Byllesby & Company, was, according to Associated Press dispatches, the ranking officer of the three American officers first to reach Berlin since the signing of the armistice. General Harries and his aides arrived in Berlin on Dec. 10 as members of the American commission for the repatriation of war prisoners.

**J. H. Mustard** of the educational department of the Westinghouse Electric & Manufacturing Company has recently been appointed head of the department of electrical engineering of the University of North Carolina. Mr. Mustard was graduated from the University of Michigan in 1902 with the degree of electrical engineer, and immediately afterward joined the Westinghouse company as a graduate student in the apprenticeship course. He has been continuously connected with the company in different capacities since that time, and in 1911 became associated with its educational work.

**Willis H. Booth,** chairman of the board of the Edison Electric Appliance Company, has been elected vice-president of the Guaranty Trust Company of New York. Mr. Booth established the Hotpoint Electric Heating Company in 1914, this company later being consolidated with the General Electric and Hughes heating appliance interests to form the Edison Electric Appliance Company. Mr. Booth's banking career began in 1905 as vice-president of the Equitable Savings Bank of Los Angeles. In 1912 this institution was consolidated with the Security Trust and Savings Bank, of which Mr. Booth became vice-president. He was also made vice-president of the Southern Trust Company. Since 1914 he has been vice-president of the Security National Bank.

**B. F. Fortner,** formerly with the Public Service Commission of Oklahoma, has been appointed superintendent of distribution of the Okmulgee (Okla.) Ice & Light Company.

**John L. Harper,** who for the last sixteen years has been chief engineer of the Hydraulic Power Company of Niagara Falls and who has been chief engineer of the Cliff Electrical Distributing Company of the same city since its inception, has been appointed chief engineer of the new Niagara Falls Power Company, formed by the consolidation of the Niagara Falls Power Company, the Hydraulic Power Company and the Cliff Electrical Distributing Company and their subsidiaries. Mr. Harper will be in charge of operation under the general manager, Paul A. Schoellkopf. Prior to his connection with the Hydraulic Power Company, Mr. Harper was associated with the Twin City Rapid Transit Company, Minneapolis, Minn., and with the St. Croix Power



J. L. HARPER

Company, Apple River, Wis. Mr. Harper is a graduate of Cornell University and a member of the American Society of Mechanical Engineers, American Society of Civil Engineers, American Electrochemical Society, American Ceramic Society, American Society for the Advancement of Science, National Geographic Society and American Civic Alliance and a fellow of the American Institute of Electrical Engineers.

## Obituary

**Dennis E. Whipple,** who for the last seven years had charge of the Central Western distribution of the "Detroit Electric," manufactured by the Anderson Electric Car Company, died suddenly on Dec. 8 from pneumonia. He was thirty-eight years old at the time of his death and for the last ten years had been associated with the producers of the "Detroit Electric." Mr. Whipple was particularly well known in the electric vehicle field not only for his achievements in the promotion of the pleasure electric car but also for the strength of his personality and his integrity of character.

# TRADE & MARKET CONDITIONS

## News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

### CENTRAL STATION TO FURNISH FIRST BUSINESS

#### Importance of Appliance Business in Future Market Emphasized at Cleveland Meeting of Electrical Jobbers

While some apprehension was expressed at the meeting of the Electrical Supply Jobbers' Association at Cleveland last week in regard to the possibility of declines in prices, thus affecting values of stocks, opinion as a whole indicated an expectation of good business, and it was held that the active business which the jobbers have enjoyed has put them in a position to meet any conditions that may arise and has strengthened their ability to give service of increasing value.

On the question of steel the statement was made by one representative that, while prices may decline, no great quantity of steel can be obtained under present conditions. There is a demand to-day, and will be for at least three or four months ahead, for a greater quantity of steel than the mills can produce. While cancellations in steel lines have been received and are still being received, there is a bright spot in the horizon in the speeding up of movements to develop foreign trade, and manufacturers, it was said, are humane enough to feel that wages cannot be lowered unless the cost of living is reduced.

Electric heating appliance prices, the opinion was expressed, will not show much change. The increases had been based absolutely on cost. While there is a hope that prices will be lowered, no prophecy was made as to when this change would take place. Great faith was felt in the probability of increased demand for heating appliances. Tremendous strides have been made in the industrial heating business, even more, it was pointed out, than in domestic lines. There was some discussion of the question of the conservation program of the manufacturers, and it was brought out in this connection that the reduction of lines, if continued as a peace measure, will reduce the amount of stocks carried by jobbers and will mean substantial economy.

That not much in large construction in the big Eastern centers will be done for six months was one of the views advanced, although some special projects are under way and are certain to go ahead. The general opinion is that after that business will be very good. A great part of the government work has been stopped, and what construction work is being done at present is government work which is being continued. In electrical construction the wage rate has been increased very little, but the total pay has increased largely because of an enormous amount of overtime.

The jobbers were urged by another speaker to give careful attention to the cost of materials. He asked how the stocks of materials accumulated by the government are to be absorbed without disturbance of the market. He thought that an enormous amount of materials produced by the government remained to be absorbed and, if not taken into normal channels, would demoralize the market.

The thought was expressed by one speaker that the almost unanimous opinion was that both prices and wages would recede gradually, that foreign demand would tend to delay this movement, and that there would not be any great amount of business until prices should be fairly stabilized. It was pointed out that there has never before been so much money in the pockets of wage earners and farmers, that the wheat crop will make the West prosperous and cotton will do likewise for the South. The underlying agricultural conditions in this country are sound, and so are retail conditions. It was stated by the speaker that central stations have expanded in the central districts to serve war factories and that the decrease in demand from these consumers will make it necessary for central stations to extend their lines to provide markets for their surplus energy. The first business, it was prophesied, would come from central stations. Already these properties are beginning to buy wire, cross-arms, poles, etc. Their next interest will be in getting the public to buy appliances. If the jobbers did not meet the opportunity in this line, they were warned that they would have competition. The demand, it was held, will be large for washing machines, vacuum cleaners and heating devices. The sales will be in small quantities, but the jobbers will buy in carload lots and will find markets for the goods. This field is bound to be a big one if it is developed intelligently. Instead of looking at disappearing business, the jobbers should look at the new business awaiting them in these lines. It was recalled to the members that the growth of the electrical business is greater than ever before and the industry has survived everything that has taken place. Before 1914 there had been no fat years. Now the jobbers have had three good years.

### SCHEDULE MANUFACTURERS NOW PREPARE FOR TRADE EXPANSION

#### Market Is Dull at Present, but Larger Business Is Confidently Looked for—Development Work Again Going Ahead

Switch and socket manufacturers are looking forward to peace conditions with confidence, though they are feeling their way along at present as regards stock accumulation. Many of these plants have been very active in filling the wants of the army, navy and shipping board, and the signing of the armistice naturally brought them face to face with important questions of future policy. A number of such manufacturers seen within the past few days by a representative of the ELECTRICAL WORLD are of the opinion that a temporary period of dullness would not be surprising, though the resumption of activities in the building trade is expected to quicken production before the winter is ended. Meanwhile, the more energetic concerns are studying the possibilities of foreign trade with might and main, and apparently firm foundations for a lasting business in other countries are being laid upon the two important bases of superior quality and ability to deliver products to customers, who are at present practically unable to secure the cheap and inferior material and designs with which the enemy attempted to flood the foreign market. For the last six weeks there has been a serious dearth of shipping facilities for this pioneer work, but it is not believed that this condition will last much longer in view of the release of vessels from munitions transportation and the speed with which the American shipbuilder is putting new craft into commission.

In conformity with the government's orders, and also because of the pressure of war demands, manufacturers of schedule material have not stocked up to any great extent at the factories. Industrial material has been shipped practically as fast as it could be produced, and such stocks of wiring supplies as are in hand represent in considerable part reserves from earlier production. Development work has been strictly curtailed during the war, but it is now

being taken up afresh in some cases, particularly along the line of creating a satisfactory socket switch for controlling appliances consuming several hundred watts. Raw materials are still quite hard to obtain in sufficient quantities, although the supply of brass is said to be easier. Porcelain is coming through better.

Some cancellations are reported, especially in connection with cantonments, but it has not been necessary as yet to cut down the personnel of the schedule material factories to any great extent. In fact, one of the leading manufacturers emphasized his desire to obtain additional labor of high quality even while anticipating a period of readjustment. Overtime, of course, is likely to be taboo for the present in plants of this kind. It appears that the factories are now pretty well caught up with their government orders, though the shipbuilding industry is likely to call for a considerable amount of wiring material during the next year, and if the naval program sponsored by Secretary Daniels is carried out, the market for marine fittings will be corresponding enlarged. Prices remain firm so far, with little disposition to forecast reductions.

## METAL MARKET SITUATION

### Copper Men Unite Against Foreign Combinations for Export Trade—Spelter and Tin Dull

Announcement of the formation of the Copper Export Association, Inc., to represent American producers of copper in foreign markets was formally made on Tuesday, following the first meeting of the organization.

The plan is purely a mutual one and provides for no advantage on account of size or location of any contributing organization, and it is hoped will fulfill the expectations of its promotors and firmly unite all American exporters of copper. For a number of years it has been possible for foreign consumers to obtain copper from American producers for about 14 cents per pound less than the American consumer paid. It is believed the export association will remedy this situation and will not permit the foreign combinations to secure such undue advantage.

Business here continues at a standstill, but resales of carload lots of electrolytic ingots by consumers have been made at under 22.75 cents. Such sales apparently represent the best that sellers can get in the present unsettled state of things and with the fear of the prices that may rule after Jan. 1, when all government control ceases.

The spelter market still continues very dull, and there is a complete absence of inquiry and business. There are reports that a good export business has been done with France. Prices remain barely steady.

Tin remains practically unchanged, and no indication has yet been received by the trade as to what plan is to be followed in restoring a free market and free importation of tin. Consumers as a whole are well supplied, and those who have no stock are only buying against their actual requirements.

Old metals still show a falling tendency.

#### NEW YORK METAL MARKET PRICES

| | Dec. 10 | Dec. 17 |
|---|---|---|
| Copper: | £ s d | £ s d |
| London, standard spot | 122 0 0 | 122 0 0 |
| | Cents per Pound | Cents per Pound |
| Prime Lake | Govt. price 26.00 | Govt. price 26.00 |
| Electrolytic | Govt. price 26.00 | Govt. price 26.00 |
| Casting | Govt. price 26.00 | Govt. price 26.00 |
| Wire base | 28.75 | 28.75 |
| Lead, trust price | 7.05 | 7.05 |
| Antimony | 8.62½ | 8.00 |
| Nickel, ingot | 40.00 | 40.00 |
| Sheet zinc, f.o.b. smelter | 15.00 | 15.00 |
| Spelter, spot | 8.67½ | 8.67½ |
| Tin | 72.50 (official) | 71.75 |
| Aluminum, 98 to 99 per cent | Govt. price 33.10 | Govt. price 33.10 |

#### OLD METALS

| | Cents per Pound | Cents per Pound |
|---|---|---|
| Heavy copper and wire | 18.50 to 19.00 | 18.50 to 19.00 |
| Brass, heavy | 10.50 to 11.00 | 10.50 to 11.00 |
| Brass, light | 8.50 to 9.00 | 8.50 to 9.00 |
| Lead, heavy | 5.25 to 5.50 | 5.25 to 5.50 |
| Zinc, old scrap | 5.25 to 5.50 | 5.25 to 5.50 |

## THE WEEK IN TRADE

HOLIDAY business, with the exception of certain isolated districts, fell off considerably this week. From a condition of shortage of stocks a few weeks ago the market has suddenly changed to one where dealers are apparently well supplied but with a very low consumer demand.

Several indications this week point to the tottering of peak prices. Iron and steel products are lower, inquiries for 24-cent copper are coming into the market, some concerns have reduced the price of wire base 2 cents or more, and distributers in a number of lines are freely predicting lower prices in the near future.

Jobbers' stocks are in pretty fair condition. No. 14 rubber-covered wire appears to be the most difficult material to obtain. Conduit supply is fairly easy now. Standard lamp stocks are much better than they were a year ago.

Fewer new credits are being given than for some time, and the tendency seems to be to exercise more caution than ever before.

## NEW YORK

Business is still dull. The Christmas trade, which showed some signs the week before of getting back to pre-war conditions, has fallen flat, and retailers are stocked with electrical goods the week before Christmas. Some stores are beginning to shade prices on appliances in order to stimulate trade.

Real estate began to show signs of life in the past week, two or three large transactions having taken place, but the outlook for much new building next spring is poor. Lack of money obtainable for building purposes is going to be one of the greatest drawbacks. At a recent meeting of the New York Building Managers' Association a representative of the leading source of money on real estate mortgages during the past fifteen years in New York City stated that he saw no early prospect for any softening of the present tension in the mortgage money situation.

**CONDUIT.**—Owing to government cancellation of contracts, conduit is coming into the market more freely and can be had now in carload lots in two to three weeks' delivery. The demand, however, outside of replenishing depleted stocks up to some semblance of normal is not great. Buyers, owing to the general cut in nearly all lines of iron and steel, are showing hesitation in taking on large stocks of conduit at present price levels and the poor building outlook. As yet there are no warehouse supplies. Metal molding for interior wiring has not been in much demand lately. The reason for this is said to be the great shortage of No. 14 wire; hence the demand for interior wiring has been almost at a standstill. Supplies on hand are good.

**WIRE.**—Better jobbers' stocks of Nos. 10, 12 and 14 rubber-covered wire are reported. Some manufacturers have no supplies of No. 14 single-braid. It is learned that wire base has been cut by producers here and there from 2 cents to 4 cents.

**LAMPS.**—The demand for lamps still continues excellent and is expected to remain so until after the holidays, when a slight falling off may be looked for. Supplies on hand are liberal and warehouses well stocked. There is a shortage of automobile lamps, particularly of the Ford type, and deliveries are four and five weeks behind.

**MOTORS.**—The market for motors of the larger sizes still remains quiet, with small sales reported this week. Fractional-motor business, on the other hand, appears to be reaching very large proportions. There is an inquiry in the market for 50,000 small motors for washing machines, and the demand is so brisk that a change in price upward

is contemplated by one of the leading producers next month. Supplies on hand are good and shipments are prompt.

**RADIATORS.**—While the jobbers are pretty well sold out of the best-known makes of radiators, purchases by the public the past week have shown a marked decrease. This undoubtedly is due to the present mild weather, it is reported. Retailers are loaded up, and one well-known and popular make which advanced in price 20 per cent a few weeks ago is being offered by many stores to-day at the price which formerly prevailed.

**PORTABLE LAMPS.**—The very large demand looked for from the Christmas trade has not materialized yet, and sales have been disappointing. Stocks on hand are large.

**HEATER CORD.**— The situation in heater cord is beginning to show some signs of improvement. For weeks past it has been impossible to obtain cord in any quantity. Shipments on back orders are now coming in.

**CREDIT.**—Since the signing of the armistice credits are being very carefully scrutinized by producers. Payments in this territory are 50 per cent slower than they were a year ago.

## CHICAGO

Three big developments in the twelve-year campaign of Chicago city planning and of actual city rebuilding took definite shape last week. The Illinois Central electrification ceased to be a battle and became a proposition within a measurable distance of realization. The Chicago Plan Commission sent to the Mayor and City Council its reconstruction platform, comprising twenty-three urgent proposals. The executive committee of the commission placed in the hands of the finance committee of the City Council a resolution unanimously recommending that the finance committee include in the 1919 municipal budget appropriations required to enable the board of local improvements to accomplish the Ogden Avenue extension and to provide for preliminary work on the Western Avenue, Robey Street, Ashland Avenue and South Water Street improvements. Every phase of the development either marked a definite advance in long pending issues or gave definite impulse to further procedure.

A deduction to be made from the comments heard among both copper producers and consumers is that the new year will be likely to start off with a lower copper price basis, and it would not be surprising if offerings under the 26-cent level became frequent during the rest of the month.

The labor supply about equals the demand in the Middle Western States, according to the first of a series of weekly reports obtained by the United States Employment Service from important industrial centers.

In Chicago a canvass of 175 employers shows the supply and demand to be about the same, but a heavy increase in requirements is expected in the coming week. This situation holds good as a general rule in Illinois, Indiana, Minnesota and Missouri. A shortage of labor is reported from South Bend, Ind.

A second epidemic of influenza is affecting manufacturers in this territory considerably. Many manufacturers report that as much as 40 to 50 per cent of their help is off work because of this epidemic. Medical men predict that next week the epidemic will be at its peak.

**VACUUM CLEANERS.**—A new low-priced vacuum cleaner will soon be put on the market by a manufacturer in this territory, to sell for about $25 retail.

**WASHING MACHINES.**—It is rumored that there will be no lowering in price for washing machines for at least the next six months.

**INDUSTRIAL LIGHTING FIXTURES.**—Now that a large number of industrial plants have got back to their normal running basis, they are taking steps to rebuild their plants and install new lighting units.

**TRANSFORMERS.**—A new transformer for industrial electric furnace work will be announced to the trade shortly.

**INDUSTRIAL CONTROL EQUIPMENT.**—The demand for this type of equipment continues heavy, but in spite of the heavy demand deliveries are getting better.

## BOSTON

Trade is marking time this week, in a sense. New orders are a little less active pending the turn of the year. Collections continue good. Some improvement is to be seen in deliveries, owing to the release of manufacturing facilities formerly largely absorbed by war work. Prices show little change, although copper wire is being shaded a cent or so a pound in some cases. Appliances are in good demand for the Christmas trade. Stocks are still relatively large, and aside from filling gaps due to the diversion of material for war requirements jobbers are ordering little. The labor situation is not as yet so disturbing as was apprehended in many quarters at the conclusion of hostilities. Jobbers' staffs are not being enlarged much at this time. The outside solicitation of business is being taken up with renewed vigor.

Gradually business is changing toward peace conditions, and the transition has so far been happily free from revolutionary upheavals. The central-station loads hold up well despite curtailment of government production in industrial centers.

**WIRE.**—Prices are being shaded slightly in some cases, owing to stocks of copper on hand. The softening tendency does not exceed 1 cent or 2 cents per pound so far as can be learned. Stocks are fairly large with the exception of smaller sizes which have been held back by government orders in the past few months. Weatherproof is quoted around 30 cents base, and rubber-covered wire at about 33 cents list.

**WASHING MACHINES.**—The market is still sold ahead of production, but deliveries are improving. Until the factories make more progress, however, in filling orders now on the books intensive solicitation will have to be discouraged among retailers. Prices hold firm.

**VACUUM CLEANERS.**—Trade continues brisk, with firm prices. Forehanded accumulation of material and reasonably satisfactory labor conditions have made it easier to meet the demand than might have been expected.

**LAMPS.**—Stocks are increasing steadily, and it is said that the shortage in miniature lamps is likely to be relieved in another two months. There is an excellent lamp business now being handled, and the relaxation of lighting restrictions is being felt in the trade.

**MOTORS.**—The motor market is a trifle quiet, and some accumulation of stocks can be seen. Underlying conditions are sound, it is believed, and nothing beyond a temporary slowing down is anticipated.

**COMMUTATORS.**—The demand is heavy, and a Connecticut manufacturer specializing in these equipments sees excellent business ahead.

**FIRE-ALARM TELEGRAPH APPARATUS.**—Manufacturers and agents speak optimistically as to the trade prospects. Municipalities will soon be preparing estimates for protection development work, and increased interest in fire protection is counted upon. Factory stocks are in good order and prices are steady with little prospect of further advances. Maintenance orders are being handled with promptness.

**RANGES.**—Central stations are not quite ready to push these outfits hard, but a turn for the better is expected within a very few weeks. Where generating units have been commandeered by the government the result has been in many cases to tie down the commercial program to meeting demands for service with as little outlay as possible, and high-powered appliances have suffered accordingly.

**ELECTRIC PASSENGER CARS.**—The demand is increasing steadily in fields cultivated through genuine sales service. Deliveries are improving and carload shipment days have returned. Just before the signing of the armistice it looked as though local agencies for pleasure cars would have to suspend operations.

**APPLIANCES.**—Light, portable units for table service are in good demand. The holiday trade is materializing well.

**FRICTION TAPE.**—Stocks are increasing somewhat. Prices still hold firm.

## ATLANTA

There is very little change to be recorded in the electrical field of the Southeast this week. The volume of business in general appears to be well maintained. Buyers are still marking time and purchases are made on the basis of small quantities for quick turnover. The propaganda which is being carried on throughout the South by certain political elements urging farmers and others to hold cotton for a much higher price is tending to curtail normal activity in the usual commercial channels and retard collections, which will in turn be reflected in the electrical trade.

No drastic fluctuations are anticipated as a result of an open market after Jan. 1. The feeling prevails that even if industry at large is able to make its own price, the present high cost of labor will preclude any startling recession during the transition period at least. Estimates of the time required to return to a normal peace basis vary, some authorities naming the middle of 1919 as the earliest possible date for a full change.

All electrical construction at the officers' training camp at Camp Gordon has been stopped, and material on hand at this point and at Camp McClellan is being shipped to Camp Benning, Columbus, Ga. It looks now as if this would be a permanent school.

The merger of the Southern Bell Telephone & Telegraph Company and the Atlanta Telephone Company has been ratified by the City Council. No action by the Atlanta City Council has been taken on the War Labor Board recommendation for a 6-cent street-car fare, following the award of 25 to 50 per cent increase in wages to platform men.

**CREDITS AND COLLECTIONS.**—Manufacturers report that collections in general are good. The small central stations, jobbers and dealers are showing up exceptionally well, and outstanding paper is slowly decreasing. Although the credit reins have been tightening for the last few months, dealers and contractors have been prompt for a much longer period, as they have enjoyed a profitable business. Collections from the utilities are spotty. Those that have been granted increases in rates and fares are doing much better than last month, but those that have not received increases are having great difficulty in meeting obligations. As the accounts of these companies normally run into large figures, the complexion of collections and the credit viewpoint of distributers depends to a large extent on how these accounts are taken care of from month to month.

**FARM-LIGHTING OUTFITS.**—Manufacturers estimate that business in the Southeast for the first eight months of 1918 was about 50 per cent greater than the last eight months of 1917. There is no indication at this time that prices will drop off for at least six months. Accessories, however, and wiring material declined from 5 to 15 per cent recently. The freeing of raw materials and increasing factory facilities have brought shipments of complete outfits down to three weeks. The greater portion of inquiries are for the ¾-kw. sets. Jobbers and dealers have done a big business in fixtures, appliances and wiring material through the purchasers of these sets, and such a latent market exists for this class of goods that the manufacturers of these outfits are putting in substantial stocks of lamps, portables, etc., in order to handle the demand direct through their own distribution points.

## SEATTLE—PORTLAND

While not pessimistic as a whole, Seattle electrical jobbers and dealers are not over-enthusiastic about this year's Christmas sales, which so far have been light. Optimistic ones believe sales will spurt during the week and that the total holiday business will be respectable and quite satisfactory. Puget Sound cities report like conditions with sales much lighter than for last year. Dealers in Tacoma especially state that the bottom has dropped out of holiday sales and that there is no indication of improvement between now and Christmas. In Seattle washing and sewing machines have been the best movers in the appliance line, while electrically heated goods have not moved nearly so well as was predicted. Electric warming pans are still expected to equal sales of last year owing to early cold weather. Sales of Christmas-tree outfits so far are negligible. A slight movement in socket-device heaters has been noticed and is expected to increase, especially if the cold weather continues during the week.

Sales to shipyards and industrials have decreased during the past two weeks, but this is explained by over-buying by some of the yards. It is fully expected that the shipyards' volume of sales will remain at normal for some time to come, as the yards have not slackened in their constructional program since the signing of the armistice. Building in Sound cities, Seattle and Tacoma especially, has shown a slight decrease. The authorities believe this decrease will be more pronounced until spring, when it is thought prices of materials and labor will experience a decided drop. Prospective builders apparently are holding off for better weather and lower prices. Large architects' offices in Seattle have considerable work of importance in prospect, such as apartments, hotels and several business blocks. These jobs are not expected to materialize until the first of March or perhaps even later. The Portland territory reports that the final decision of the government to cancel wooden-ship contracts has naturally had a disheartening effect upon business. A number of concerns the output of which has been going exclusively to wooden shipyards will have to readjust their entire business and seek new outlets unless new ship contracts are forthcoming immediately from another source. Steel yards in the Portland district are progressing in very satisfactory manner, and the usual sales volume is sustained. In general, business is marking time and trying to adjust itself to a peace basis. The feeling is that there will be five or six months of readjustment before conditions become really stable again, although this in no way means that the present condition is panicky.

Seattle jobbers report that collections are keeping pace with sales and are satisfactory in spite of the approaching holidays, when collections are usually smaller. Very few new credits are being placed. Enterprises apparently are waiting for the passing of the transition period. Out-of-town collections are easy to make and new and important credits are negligible.

## SAN FRANCISCO

Included in the after-war building program for San Francisco public buildings are extensive additions and a new school bond issue of $3,500,000 providing for twenty-three new school buildings. One school building contract for about $190,000 has just been let, and plans for others are in the course of construction. In other municipal departments appropriations for deferred extensions of facilities include hospital and health department buildings, fire and police buildings as well as smaller structures. The State Council of Defense in ceasing its activities announced last week that the value of building permits denied was one-third the value of permits granted during the period of its control over such activities. Much of the forbidden construction will be undertaken this year it is believed. The sale of $1,000,000 of Hetch Hetchy bonds last week with option on $8,000,000 more has assured continued construction activity on that project. The present program contemplates an expenditure of $200,000 per month.

Electric welding equipment, including both large and small motor-generator sets, balancer sets and alternating-current sets, is in demand. Moving-picture machines of small size motor-driven and using lamps instead of a carbon arc have recovered rapidly in the last few weeks. With this has come a notable increase in the time-demand for 400-watt lamps, which are used in such machines. Incandescent lamps will continue to be in demand, it is believed. The call for 20, 40 and 50-watt sizes is being strengthened by the discontinuance of free renewals in Gem lamps which two large lighting companies have recently announced. The production of lamps on the Pacific Coast has been increased recently as a reason of the marked improvement in labor conditions.

# Current Prices of Electrical Supplies

## *New York and Chicago Quotations*

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

### ARMORED CONDUCTOR, FLEXIBLE STEEL

*Single-Conductor*

| B. & S. Size | List per 1000 Ft. |
|---|---|
| No. 14 solid | $61.00 |
| No. 12 solid | 71.00 |
| No. 10 solid | 90.00 |
| No. 8 solid | 106.00 |
| No. 6 solid | 145.00 |
| No. 10 stranded | 95.00 |
| No. 8 stranded | 115.00 |
| No. 6 stranded | 160.00 |
| No. 4 stranded | 205.00 |
| No. 2 stranded | 266.00 |
| No. 1 stranded | 315.00 |

*Twin-Conductor*

| | |
|---|---|
| No. 14 solid | 104.00 |
| No. 12 solid | 135.00 |
| No. 10 solid | 185.00 |
| No. 8 stranded | 235.00 |
| No. 6 stranded | 370.00 |
| No. 4 stranded | 575.00 |

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

*Single-Conductor*

| | No. 14 Solid |
|---|---|
| Less than coil | List |
| Coil to 1000 ft | 10% |
| | **No. 12 Solid** |
| Less than coil | List |
| Coil to 1000 ft | 10% |

*Twin-Conductor*

| | No. 14 Solid |
|---|---|
| Less than coil | List |
| Coil to 1000 ft | 10% |
| | **No. 12 Solid** |
| Less than coil | List |
| Coil to 1000 ft | 10% |

DISCOUNT—CHICAGO

*Single-Conductor*

| | No. 14 Solid |
|---|---|
| Less than coil | +30% to +20% |
| Coil to 1000 ft | List |
| | **No. 12 Solid** |
| Less than coil | +30% to +20% |
| Coil to 1000 ft | List |

*Twin-Conductor*

| | No. 14 Solid |
|---|---|
| Less than coil | $115.00 |
| Coil to 1000 ft | 100.00 |
| | **No. 12 Solid** |
| Less than coil | +30% to +20% |
| Coil to 1000 ft | List |

### ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg | +20% |
| 1/5 to std. pkg | List |
| Std. pkg | 15% to 17% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg | +30% to List |
| 1/5 to std. pkg | +5% to 20% |
| Std. pkg | 18% to 30% |

### BATTERIES, DRY

NEW YORK

| Each Net | No. 6 Regular | No. 6 Ignitor |
|---|---|---|
| Less than 12 | $0.45—$0.46 | $0.45—$0.47 |
| 12 to 50 | .40 | .40— .41 |
| 50 to barrel | .35— .36 | .36— .37 |
| Barrel lots | .32— .329 | .33— .339 |

### BATTERIES, DRY—Continued

CHICAGO

| Each Net | No. 6 Regular | No. 6 Ignitor |
|---|---|---|
| Less than 12 | $0.40 to $0.45 | $0.40 to $0.45 |
| 12 to 50 | .35 to .38 | .35 to .38 |
| 50 to barrel | .319 to .35 | .329 to .35 |
| Barrel lots | .289 to .32 | .299 to .32 |

### CONDUIT, METALLIC FLEXIBLE

| Size, In. | Ft. per Coil | List per 100 Ft. |
|---|---|---|
| ⅜ | 250 | $5.00 |
| ½ | 250 | 7.50 |
| ¾ | 100 | 10.00 |
| 1 | 50 | 13.00 |
| 1¼ | 50 | 21.00 |
| 1½ | 50 | 26.00 |
| 1¾ | 25–50 | 35.00 |
| 2 | 25–50 | 45.00 |
| 2½ | 25–50 | 52.00 |

NET PER 1000 FT.—NEW YORK

| | Less than Coil | Coil to 1000 Ft. |
|---|---|---|
| ⅜-in. single trip | $75.00 | $63.75— 69.75 |
| ⅜-in. double strip | 75.00— 82.50 | 72.00— 75.00 |
| ½-in. single strip | 100.00 | 85.00— 93.00 |
| ½-in. double strip | 100.00—110.00 | 96.00—100.00 |

NET PER 1000 FT.—CHICAGO

| | Less than Coil | Coil to 1000 Ft. |
|---|---|---|
| ⅜-in. single strip | $75.00 | $63.25 to $63.75 |
| ⅜-in. double strip | 78.25 to $78.75 | 71.25 |
| ½-in. single strip | 100.00 | 75.00 to 85.00 |
| ½-in. double strip | 105.00 | 93.00 to 95.00 |

### CONDUIT, NON-METALLIC FLEXIBLE

| Size, In. | List per Foot | Size, In. | List per Foot |
|---|---|---|---|
| ⅜ | $0.05½ | 1 | $0.25 |
| ½ | .06 | 1¼ | .33 |
| ¾ | .09 | 1½ | .40 |
| ⅞ | .12 | 1¾ | .47 |
| ⅞ | .15 | 2 | .55 |
| ¼ | .18 | 2½ | .65 |

NET PER 1000 FT.—NEW YORK

| | Less than $15 List | $15 to $60 List | $60 to $150 List |
|---|---|---|---|
| ⅜-in.— | $25.00–50.70 | $24.00–35.20 | $23.00–30.25 |
| ½-in.— | 30.00–56.40 | 28.00–38.40 | 26.00–33.00 |

NET PER 1000 FT.—CHICAGO

| | Less than $15 List | $15 to $60 List | $60 to $150 List |
|---|---|---|---|
| ⅜-in.— | $60.00 | $30.00 | $26.00–29.15 |
| ½-in.— | 65.00 | 33.50 | 29.00 |

### CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

*Card No. 40*

| Size, In. | Conduit, List per Foot |
|---|---|
| ⅛ | $0.08½ |
| ¼ | .08½ |
| ⅜ | .08½ |
| ½ | .11½ |
| ¾ | .17 |
| 1 | .23 |
| 1¼ | .27½ |
| 1½ | .37½ |
| 2 | .58½ |
| 2½ | .76½ |
| 3 | |

### CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

| Size, In. | Couplings, List | Elbows, List |
|---|---|---|
| ⅛ | $0.05 | $0.19 |
| ¼ | .06 | .19 |
| ⅜ | .07 | .19 |
| ½ | .10 | .25 |
| ¾ | .13 | .37 |
| 1 | .17 | .45 |
| 1¼ | .21 | .50 |
| 1½ | .28 | 1.10 |
| 2 | .40 | 1.80 |
| 2½ | .60 | 4.80 |
| 3 | | |

DISCOUNT—NEW YORK

| | ⅛ in. to ½ in. | ¾ in. to 3 in. |
|---|---|---|
| Less than 2500 lb | 7% to 7.1% | 9% to 9.1% |
| 2500 to 5000 lb | 10% to 10.1% | 12% to 12.1% |

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

| | ⅛ to ½ In. | ¾ to 3 In. |
|---|---|---|
| Less than 2500 lb | +5.5% to 3.5% | +3.5% to +1.5% |
| 2500 to 5000 lb | +2.5% to +0.5% | +5% to 1.5% |

(For galvanized deduct six points from above discounts.)

### FLATIRONS

NEW YORK

| | |
|---|---|
| List price | $6.00 to $6.50 |
| Discount | 20% to 25% |

CHICAGO

| | |
|---|---|
| List price | $6.00 to $7.00 |
| Discount | 20% to 30% |

### FUSES, INCLOSED

| 250-Volt | Std. Pkg. | List |
|---|---|---|
| 3-amp. to 30-amp. | 100 | $0.25 |
| 35-amp. to 60-amp. | 100 | .35 |
| 65-amp. to 100-amp. | 50 | .90 |
| 110-amp. to 200-amp. | 25 | 2.00 |
| 225-amp. to 400-amp. | 25 | 3.60 |
| 450-amp. to 600-amp. | 10 | 5.50 |
| **600-Volt** | | |
| 3-amp. to 30-amp. | 100 | $0.40 |
| 35-amp. to 60-amp. | 100 | .60 |
| 65-amp. to 100-amp. | 50 | 1.50 |
| 110-amp. to 200-amp. | 25 | 2.50 |
| 225-amp. to 400-amp. | 25 | 5.50 |
| 450-amp. to 600-amp. | 10 | 8.00 |

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg | 30% |
| 1/5 to std. pkg | 41% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg | 30% |
| 1/5 to std. pkg | 40% to 41% |

### FUSE PLUGS

*3-Amp. to 30-Amp.*

NEW YORK

| | Per 100 Net |
|---|---|
| Less than 1/5 std. pkg | $6.00 to $3.75 |
| 1/5 to std. pkg | 5.25 to 7.00 |

Standard packages, 500. List, each, $0.07

CHICAGO

| | Per 100 Net |
|---|---|
| Less than 1/5 std. pkg | $8.00 |
| 1/5 to std. pkg | 7.00 |

Standard packages, 500. List, each, $0.07

## LAMPS, MAZDA OR TUNGSTEN

*110 to 125 Volts*

| Regular, Clear: | Std. Pkg. | List, Each |
|---|---|---|
| 10 to 40-watt—B | 100 | $0.35 |
| 60-watt—B | 100 | .40 |
| 100-watt—B | 24 | .85 |
| 75-watt—C | 50 | .70 |
| 100-watt—C | 24 | 1.10 |
| 200-watt—C | 24 | 2.20 |
| 300-watt—C | 24 | 3.25 |
| Round Bulbs, 3½-in., Frosted: | | |
| 15-watt—G 25 | 50 | .60 |
| 25-watt—G 25 | 50 | .60 |
| 40-watt—G 25 | 50 | .60 |
| Round Bulbs, 3½-in., Frosted: | | |
| 60-watt—G 30 | 24 | .82 |
| Round Bulbs, 4½-in., Frosted: | | |
| 100-watt—G 35 | 24 | 1.15 |

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than std. pkg. | List |
| Std. pkg. | 10% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than std. pkg. | List |
| Std. pkg. | 10% |

## LAMP CORD

*Cotton-Covered, Type C, No. 18*

NEW YORK

| | Per 1000 Ft. Net |
|---|---|
| Less than coil (250 ft.) | $30.47—$40.77 |
| Coil to 1000 ft. | 27.42— 32.98 |

CHICAGO

| | Per 1000 Ft. Net |
|---|---|
| Less than coil (250 ft.) | $38.00 |
| Coil to 1000 ft. | 28.00 |

## LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

| | |
|---|---|
| Net per 100 | $24.00 to $33.00 |

CHICAGO

| | |
|---|---|
| Net per 100 | $23.93 to $30.00 |

## OUTLET BOXES

| Nos. | List per 100 |
|---|---|
| 101—A, A 1½, 4 S.C., 6200, 320 | $30.00 |
| 102—B.A., 6200, S.E., 300, A.X., 1½, 4 S. | 30.00 |
| 103—C.A., 9, 4R, B 1½ | 25.00 |
| 106—F.A., 7, C.S., 1½, 3 R | 20.00 |

DISCOUNT—NEW YORK

| | Black | Galvanized |
|---|---|---|
| Less than $10.00 list | 26% | 20% |
| $10.00 to $50.00 list | 36% | 31% |

DISCOUNT—CHICAGO

| | Black | Galvanized |
|---|---|---|
| Less than $10.00 list | 20% | 10% |
| $10.00 to $50.00 list | 30% | 20% |

## PIPE FITTINGS

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg. | 10% |
| 1/5 to std. pkg. | 20% |
| Std. pkg. | 30% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg. | 5% |
| 1/5 to std. pkg. | 15% |
| Std. pkg. | 25% |

## PORCELAIN CLEATS—UNGLAZED

*Two and Three Wire*

NEW YORK

| | Per 1000 Net |
|---|---|
| Less than 1/5 std. pkg. | $20.00 to $21.00 |
| 1/5 to std. pkg. | 17.00 to 17.85 |
| Standard package, 2200. List per 1000, $21 to $34 | |

CHICAGO

| | Per 1000 Net |
|---|---|
| Less than 1/5 std. pkg. | $21.00 |
| 1/5 to std. pkg. | 17.85 |
| Standard package, 2200. List per 1000, $20.00–21.00 | |

## PORCELAIN KNOBS

NEW YORK

| Per 1000 Net. | Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C. | Std. Pkg. 4000 N.C. |
|---|---|---|
| Less than 1/5 std. pkg. | $16.00—$32.00 | |
| 1/5 to std. pkg. | 13.60— 27.20 | |

CHICAGO

| Per 1000 Net. | Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C. | Std. Pkg. 4000 N.C. |
|---|---|---|
| Less than 1/5 std. pkg. | $13.00—$32.00 | |
| 1/5 to std. pkg. | 11.50— 27.20 | |

## SOCKETS AND RECEPTACLES

| | Std. Pkg. | List |
|---|---|---|
| ¼-in. cap key and push sockets | 500 | $0.33 |
| ¼-in. cap keyless socket | 500 | .30 |
| ¼-in. cap pull socket | 250 | .60 |

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg. | +20% |
| 1/5 to std. pkg. | List |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg. | List |
| 1/5 std. pkg. | 10% |

## SWITCHES, KNIFE

*250-Volt, Front Connections, No Fuse*

| | |
|---|---|
| High Grade: | |
| 30-amp. S. P. S. T. | $0.80 |
| 60-amp. S. P. S. T. | 1.20 |
| 100-amp. S. P. S. T. | 2.25 |
| 200-amp. S. P. S. T. | 3.48 |
| 300-amp. S. P. S. T. | 5.34 |
| 30-amp. D. P. S. T. | 1.20 |
| 60-amp. D. P. S. T. | 1.78 |
| 100-amp. D. P. S. T. | 3.38 |
| 200-amp. D. P. S. T. | 5.20 |
| 300-amp. D. P. S. T. | 8.00 |
| 30-amp. 3 P. S. T. | 1.80 |
| 60-amp. 3 P. S. T. | 2.68 |
| 100-amp. 3 P. S. T. | 5.08 |
| 200-amp. 3 P. S. T. | 7.80 |
| 300-amp. 3 P. S. T. | 12.00 |
| Low Grade: | |
| 30-amp. S. P. S. T. | $0.42 |
| 60-amp. S. P. S. T. | .74 |
| 100-amp. S. P. S. T. | 1.50 |
| 200-amp. S. P. S. T. | 2.70 |
| 30-amp. D. P. S. T. | .68 |
| 60-amp. D. P. S. T. | 1.22 |
| 100-amp. D. P. S. T. | 2.50 |
| 200-amp. D. P. S. T. | 4.50 |
| 30-amp. 3 P. S. T. | 1.02 |
| 60-amp. 3 P. S. T. | 1.84 |
| 100-amp. 3 P. S. T. | 3.76 |
| 200-amp. 3 P. S. T. | 6.76 |

DISCOUNT—NEW YORK

| | High Grade |
|---|---|
| Less than $10 list | +15% to +10% |
| $10 to $25 list | 2% to 5% |
| $25 to $50 list | 5% to 10% |
| | Low Grade |
| Less than $10 list | +5% to list |
| $10 to $25 list | 8% to 15% |
| $25 to $50 list | 15% to 20% |

DISCOUNT—CHICAGO

| | High Grade |
|---|---|
| Less than $10 list | + 15% |
| $10 to $25 list | List to 2% |
| $25 to $50 list | 5% |
| | Low Grade |
| Less than $10 list | +5% |
| $10 to $25 list | 8% |
| $25 to $50 list | 15% to 16% |

## SWITCHES, SNAP AND FLUSH

*5-Amp. and 10-Amp., 125-Volt Snap Switches*

| | Std. Pkg. | List |
|---|---|---|
| 5-amp. single-pole | 250 | $0.28 |
| 5-amp. single-pole, ind. | 250 | .32 |
| 10-amp. single-pole | 100 | .48 |
| 10-amp. single-pole, ind. | 100 | .54 |
| 5-amp. three-point | 100 | .54 |
| 10-amp. three-point | 50 | .76 |
| 10-amp., 250-volt, D. P. | 100 | .66 |

*10-Amp., 250-Volt Push-Button Switches*

| | Std. Pkg. | List |
|---|---|---|
| 10-amp. single-pole | 100 | $0.45 |
| 10-amp. three-way | 50 | .70 |
| 10-amp. double-pole | 50 | .70 |

## SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

| | |
|---|---|
| Less than 1/5 std. pkg. | +20% |
| 1/5 to std. pkg. | List |
| Std. pkg. | 15% to 17% |

DISCOUNT—CHICAGO

| | |
|---|---|
| Less than 1/5 std. pkg. | List to 10% |
| 1/5 to std. pkg. | 10% to 16⅔% |
| Std. pkg. | 18% to 25% |

## SWITCH BOXES, SECTIONAL CONDUIT

| Union and Similar— | List Each |
|---|---|
| No. 155 | $0.34 |
| No. 160 | .60 |

DISCOUNT—NEW YORK

| | Black | Galvanized |
|---|---|---|
| Less than $2.00 list | Net to 18% | Net |
| $2.00 to $10.00 list | 10% to 28% | 5% |
| $10.00 to $50.00 list | 20% to 45% | 10% |

DISCOUNT—CHICAGO

| | Galvanized | Black |
|---|---|---|
| Less than $2.00 list | 25% to 40% | 20% to 30% |
| $2.00 to $10.00 list | 25% to 50% | 20% to 40% |
| $10.00 to $50.00 list | 25% to 64% | 20% to 52% |

## TOASTERS, UPRIGHT

NEW YORK

| | |
|---|---|
| List price | $6.00 to $6.50 |
| Discount | 20% to 25% |

CHICAGO

| | |
|---|---|
| List price | $6.50 to $7.00 |
| Discount | 20% to 30% |

## WIRE ANNUNCIATOR

NEW YORK

| | Per Lb. Net |
|---|---|
| No. 18, less than full spools | $0.55–$0.66 |
| No. 18, full spools | .53– .56 |

CHICAGO

| | Per Lb. Net |
|---|---|
| No. 18, less than full spools | $0.65 to $0.75 |
| No. 18, full spools | .55 to .635 |

## WIRE, RUBBER-COVERED, N. C.

*Solid-Conductor, Single-Braid*

NEW YORK

| | Price per 1000 Ft. Net | | |
|---|---|---|---|
| No. | Less than 500 Ft. | 500 to 1000 Ft. | 1000 to 5000 Ft. |
| 14 | $20.00–$25.00 | $13.50–$17.00 | $12.50–$15.00 |
| 12 | 25.00– 27.09 | 22.50– 23.22 | 18.75– 23.22 |
| 10 | 31.26– 32.40 | 28.66– 32.40 | 25.00– 27.45 |
| 8 | 43.92– 45.72 | 40.26– 45.72 | 35.14– 38.10 |
| 6 | 63.69– 72.36 | 57.90– 60.30 | 55.58– 57.88 |

CHICAGO

| | Price per 1000 Ft. Net | | |
|---|---|---|---|
| No. | Less than 500 Ft. | 500 to 2500 Ft. | 2500 to 5000 Ft. |
| 14 | $25.00 | $18.00–$25.00 | $15.50 |
| 12 | $29.46– 31.44 | 29.46– 31.44 | $25.54– 31.44 |
| 10 | 41.10– 43.84 | 41.10– 43.84 | 34.62– 38.36 |
| 8 | 57.00– 61.76 | 57.00– 61.76 | 50.18– 54.04 |
| 6 | 85.31– 97.68 | 85.31– 85.47 | 77.21– 85.47 |

## WIRE, WEATHERPROOF

*Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.*

NEW YORK

| | Per 100 Lb. Net |
|---|---|
| Less than 25 lb. | $39.75 |
| 25 to 50 lb. | 39.75 |
| 50 to 100 lb. | 38.75 |

CHICAGO

| | Per 100 Lb. Net |
|---|---|
| Less than 25 lb. | $39.76 to $41.00 |
| 25 to 50 lb. | 38.76 to 40.00 |
| 50 to 100 lb. | 37.76 to 39.00 |

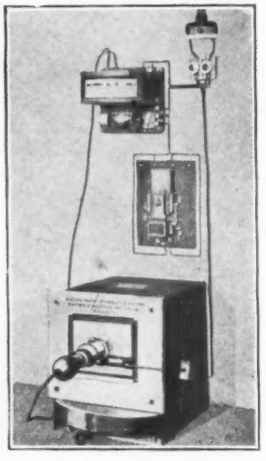
# NEW APPARATUS & APPLIANCES

## A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

### Automatic Control of Furnace Temperature

Control of furnace temperature within 1 per cent is attained by the use of the Brown automatic temperature-control pyrometer, according to the maker, the Brown Instrument Company of Philadelphia.

The temperature indicator has a pointer which is depressed by a small motor at intervals of ten seconds, upon platinum contacts, although no current



TEMPERATURE CONTROL WITHIN 1 PER CENT

passes through the needle itself. These contacts complete a relay circuit, which in turn affects the main control switch or valve to raise or lower the temperature. The contact-making device is adjustable along the temperature scale, and the high and low contacts are insulated by a very short distance, equivalent to 1 per cent of the scale.

The illustration shows an automatic control instrument with relay and switch for controlling electric furnace temperatures. The pyrometer shown is of the high-resistance type, of 600 ohms, and is operated either by a base metal or platinum-rhodium thermocouple installed in the furnace. By the use of electrically operated valves gas-furnace temperatures may likwise be controlled.

### Non-Water-Tight Round Outlet Box

A recent addition to its line of marine lighting and signaling apparatus is the non-water-tight 3¼-in. (8.25-cm.) round outlet box manufactured by the Benjamin Electric Manufacturing Company, 806 West Washington Boulevard, Chicago. Plunger key or keyless receptacles having a base of high-heat-molded insulating material are furnished with these boxes, which have a rating of 600 watts, 250 volts. The boxes have one side boss which is regularly tapped for ½-in. (1.27-cm.) conduit while the boxes for keyless receptacles will, if specified, be tapped for ½-in. (1.27-cm.) outlet in the bottom. The outlet box itself is 1½ in. (3.81 cm.) deep, 3¼ in. (8.25 cm.) in diameter and made of brass or iron as specified while the cover is of heavy sheet brass finished with emery bronze. Standard marine black finish is used with the iron boxes and may be obtained on the brass boxes when desired, although these are regularly supplied unfinished.

### Spark-Principle Cable-Fault Finder

An electric cable fault-finding apparatus has been recently developed by Norman Stell & Company, Bradford, England, using a high-potential and high-frequency discharge or spark for fault indicating, the conductor of the cable being connected to one terminal or earth, and the cable itself run through a hand clip which is connected to the high-tension terminal by flexible leads.

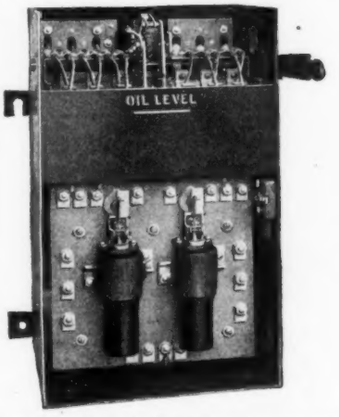
The apparatus consists of an induction coil controlled by specially arranged instruments, energy being derived from any commercial alternating-current or direct-current lighting supply. For general work a "Standard" outfit is supplied fitted with four sets of fault finding, each being separately controlled. The twenty ranges of regulation in this apparatus give a large field of use. The apparatus is arranged for connection to a lamp socket or a wall plug, and everything but leads and clips is contained in an easily portable wooden case. A smaller model fitted for two sets of findings with sixteen regulation ranges is also obtainable.

A number of distinct advantages are claimed for these fault finders by the makers. Cables may be kept perfectly dry so that better repairs are more easily made, and finished wires and cables which would be injured by water or dampness can be examined for faults. Also cores may be examined before vulcanization, thus obviating separate curing of the cables. Since no batteries or vibrators are used, the detecting spark, which is both audible and visible, remains constant, thus eliminating expensive renewals. Being static, the spark is also said not to damage insulation as an ordinary high-tension alternating current sometimes does. Faults of comparatively high resistance are said to be easily detected, hence avoiding the customary and often damaging "break-down" of faults.

### Self-Contained Compensator

An auto-starter has been so designed that the entire device, including the switch mechanism, transformer, no-voltage release and time-limit overload relay, is inclosed in a single dust-tight steel housing which is arranged for wall or floor mounting. This is a considerable departure from the usual construction having drum-switch arrangement and removable oil tank. The switch mechanism, which consists of two three-pole quick-break sliding contact switches, operates within a stationary oil tank situated toward the top of the casing, the mechanism being arranged so that it may be readily raised from the oil tank for inspection and repair by revolving about the operating shaft.

The transformer element of the compensator is attached to the back panel of the casing and mounted directly below the oil tank. At the front of the transformer there is attached a panel containing time-limit overload relays, terminals for the line and motor leads as well as transformer taps. An interesting feature which the manufac-




ALL MECHANISM INCLOSED IN DUST-TIGHT HOUSING

turers claim for this compensator is that all transformer taps are brought to terminals on this panel so that for changing transformer taps it is necessary only to remove the casing cover and change the leads from one terminal to another.

These compensators are arranged for conduit wiring, the casing being fitted with knock-outs for conduit connections at the sides and at the bottom. A conspicuous stop button is placed at the side of the casing for stopping the motor, and it is possible to arrange for several buttons for stopping the motor at remote points when this is desirable. The device is known as the I-C compensator, manufactured by the Industrial Controller Company of Milwaukee.

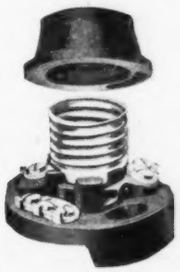
## Ready-Made Multiple Clamps

Any group of cables or conduits may be supported on ceilings or walls by a ready-made multiple clamp. It has been customary, the makers say, for contractors and construction men to make up such clamps on the job, according to the particular requirements, but they may now be obtained in all sizes ready-made from the Diamond Expansion Bolt Company, 90 West Street, New York City. By quantity production they should also be cheaper.

## Receptacles for Branch Circuits and Receptacle Switches

Additions to the marine lighting apparatus manufactured by the Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, are the branch circuit receptacles recently placed on the market. The receptacles may be had with six and eight binding screws and have switch terminals and a rating of 660 watts and 250 volts. The extra binding screws make provision for taking taps from the terminal plates, thus avoiding soldered connections.

Combination receptacle switches have also been developed by this firm. Although a keyless receptacle and a single-pole switch of the quick-make-and-break type having a plunger control are mounted on a common base, they are used independently of each other. The receptacle may be used



NO SOLDERED JOINTS REQUIRED

with a lamp when fitted in a fixture or to hold an attaching plug if used in an outlet box, while the switch may be used for controlling the branch circuit receptacle mentioned above. These receptacle switches are furnished with either three or five binding screws and have the same receptacle rating as the branch circuit receptacle and a switch rating for 5 amp., 125 volts.

High-heat-molded insulation material is used for the bases of all these devices, which have bayonet slot holes for supporting screws, spaced 1¾ in. (4.5 cm.) on centers. Lamp grips and caps are supplied or omitted in different catalog numbers of these receptacles and receptacle switches.

## Adjustable Light Brackets for Industrial Use

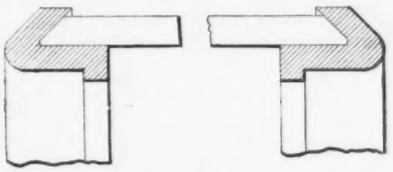
The No. 6 adjustable electric light holder and bracket manufactured by the Faries Manufacturing Company of Decatur, Ill., and particularly adapted to the lighting of individual machines in industrial plants and factories has been recently improved so that it may now serve as a floor fixture in addition to its use from ceilings and walls. In this fixture three horizontal and two vertical points of adjustment are provided, making it possible to focus the light rays from a Faries steel reflector at any point within a circle of space 10 ft. (3 m.) in diameter. Finishes of black japan and brushed brass are supplied on these brackets.

## Ornamental Bowl for Lighting Fixture

A new opal glass ornamental bowl has been recently developed by the Beardslee Chandelier Manufacturing Company, 237 South Jefferson Street, for use with its "Denzar" indirect-lighting unit. The conventional border around the upper portion of the bowl is hand-colored in red and green, the colors being baked in to insure permanency. According to the manufacturer, the ornamentation does not cause shadows and does not interfere in any way with the quality of light. The new bowl is said to be particularly adaptable for installation in churches, club rooms, public buildings and other places where artistic and ornamental lighting fixtures are desired.

## Induction Motor Rotor Bars Clamped in Place

One of the unique features of the "Uniframe" alternating-current motors being manufactured by the B. A. Wesche Electric Company, Cincinnati,



ELECTRICAL CONTACT PROVIDED WITHOUT SOLDER

Ohio, is the absence of solder in the construction of the standard squirrel-cage rotor for constant-speed service. It is said by the maker that perfect mechanical and electrical contact is secured between the rotor bars and the rings, at the same time eliminating the disadvantages connected with the use of solder. As can be seen in the accompanying illustration, there is a triangular slot in the rings into which the rotor-bar ends are shaped to wedge in snugly.

A single frame is used interchangeably for alternating-current motors and direct-current machines of the same approximate rating, and the same end bracket serves either for the slip-ring induction motor or the direct-current motors or generators. Both the alternating-current and direct-current motors may be had in ratings from ¼ hp. to 50 hp.

# *Notes on Recent Appliances*

### Electric Furnaces

Small and large electric furnaces in which the current is passed through a carbon metal-holding crucible are being made by the Bario Metal Corporation, 167 West Eighteenth Street, New York City.

### Conduit Bender

A machine which makes standard elbows, goose-neck offsets and odd-shaped bends in conduit is being made by the Trans-Com Lighting Products Corporation, 508 Broome Street, New York City. The bender is portable and may be attached to benches.

### Cut-Out Hanger

A cut-out hanger which disconnects the circuit from a reflector lighting fixture hung high above the floor when it is desired to lower the reflector for renewing the lamp for cleaning has been developed by the George Cutter Company of South Bend, Ind.

### Wiring Devices for Industrial Use

A three-phase wiring support having cleats with one of the upper corners removable, an anchor for mounting outlet boxes on concrete ceilings, columns and walls, and an adjustable clamp for securing conduit or other pipe lines to I-beams are being manufactured by the Efficiency Electric Company of East Palestine, Ohio.

### Duplex Volt-Ammeter and Volt-Wattmeter

A line of portable direct-current duplex volt-ammeters furnished with readings of 1, 2 or 3 volts and 1, 2 or 3 amp. has been recently placed upon the market by the Reliance Instrument Company, 1135 Van Buren Street, Chicago. Duplex volt-wattmeters for testing lamps and appliances usually connected to lamp sockets are also being manufactured by the Reliance Instrument Company.

## Trade Notes

### Foreign Trade Opportunities

The Bureau of Foreign and Domestic Commerce, Washington, D. C., reports under No. 27,766 that a mining engineer in France desires to obtain an agency on a commission basis for the sale of tools and machinery, among which are the following items of electrical equipment: Transformers, motors, meters, insulators, wire and high-tension and low-tension apparatus. Correspondence in this case should be in French.

A company operating in Canada (No. 27,779) desires to purchase or to secure an agency for electrical motors, lamps and all kinds of electrical goods. Terms, cash against documents for either purchase or agency.

An agency is desired by a man in Switzerland (No. 27,776) for the sale of electrical motors and supplies and material for electric lines and electrification of railroads.

A. Stauble, dealer in electrical and industrial equipment, 76 Foro Bonaparte, Milan, Italy, informs the ELECTRICAL WORLD that he wishes to extend the range of electrical and mechanical machinery products now sold by him. He states that at the present time there is a good market for American products in Italy.

Fred A. La Grange, engineer for the Argentine government railways, is in the United States placing orders for equipment for the steam roads of Argentina. Mr. La Grange is of the opinion that the construction of electric roads will be taken up soon but may be delayed on account of the enormous capital required for the transformation of the lines which run into the capital of Argentina. During the last four and one-half years some of the roads in the Argentine Republic have been unable to receive materials, and therefore they are at present in great need of materials. It is estimated that during the two coming years the importation of these materials will amount to more than $100,000,000. They will be used exclusively to replace that which has been used up and for accumulation of the indispensable reserve. Mr. La Grange has at the present time the disposal of orders amounting to roughly $50,000,000. In the past 95 per cent of the materials purchased for the Argentine railroads came from Europe.

A Greek merchant (No. 27,758) wishes to secure agency for electric motors.

An importer and commission agent in southern Italy (No. 27,762) desires to secure an agency for electric motors and supplies.

A firm of contractors in Canary Islands (No. 27,805) desires to secure an agency for the sale among other things of electrical material and machines and house meters.

J. J. McKee, formerly New York manager of the C. A. Dunham Company, has resigned to become associated with the Machinery Utilities Company of 501 Fifth Avenue, New York City.

### Western Electric Sales Changes

GEORGE E. CULLINAN, who since 1909 has been manager of the Western Electric Company at St. Louis, has been appointed manager of the Chicago house of the company and central district sales manager, succeeding Frank A. Ketcham, who was recently promoted to be general sales manager of the company. Mr. Cullinan began to work for the company in 1901 as an employee of the accounting department in New York. He became head of the billing department in 1902, was advanced to a similar position in charge of the apparatus stock in 1904, was made chief of the shipping and traffic departments in 1905. In 1906 he became employment agent and in 1907 head of the service and merchandise department. In October of the same year he went to St. Louis as assistant manager, becoming sales manager in April, 1909. Six months later he was promoted to the managership. He held this position up to the time of his promotion, with the exception of a few months as assistant manager at Chicago, the house to which he now goes as manager. Since November, 1916, Mr. Cullinan has been the Western district manager.

HARRY N. GOODELL succeeds Mr. Cullinan at St. Louis. He has been advanced from the position of manager of the Omaha house. He was employed by the company as a clerk in the billing and voucher department of the Chicago house in January, 1906. A month later he was made general clerk of the shipping department and in the following year assistant clerk in the office. He remained with the Chicago house, being promoted at intervals of about a year, until February, 1912, when he was transferred to New York to undertake special studies. In April of the same year he was appointed manager of the Omaha house and held that position until his selection last month to succeed Mr. Cullinan.

MARCUS A. CURRAN replaces Mr. Goodell as manager of the Omaha house. Mr. Curran began his career with the company in the credit department in January, 1911, and remained there for seven years. In 1912 he was transferred to the credit department in Chicago and later in the same year became credit manager at Minneapolis. In June, 1913, he was promoted to the position of general credit manager, which he held until last July, when he was appointed manager of the line-material department. A month or two later he went to Philadelphia as assistant manager, and he leaves that position to take up his new duties in Omaha.

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ASBESTOS CAN NOW BE EXPORTED.—The War Trade Board announced, effective Dec. 5, the removal of asbestos in its different forms from the export conservation list.

DAY NURSERY FOR CHILDREN OF WOMEN OPERATORS.—The New Departure Manufacturing Company of Bristol, Conn., some months ago established a day nursery for the children of its women operators. In the beginning the number of children cared for was very small, but at the present time more than twenty daily attend. The children are received in the early morning, entertained, fed and properly cared for during the day, even to the extent of providing a comfortable couch upon which they can take a nap, and are returned to the mother at night. A scheme of this nature has been found to make it much easier for factories to secure competent and reliable women operatives.

DEALERS' STOCK ASSORTMENTS.—In the current issue of *Mohawk News Service*, A. M. Little, president of the Mohawk Electrical Supply Company of Syracuse, N. Y., makes a special effort to guide the purchases of dealers along constructive sales lines. One paragraph from his interesting letter is here quoted: "The important point is to select your line of electric gift appliances to take advantage of the present trend of popular preference. What you want is a small assortment of best sellers, rather than a bigger variety of designs that will confuse the shopper." To guide the dealer the Mohawk company selected from the market a number of devices which it recommended for quick and profitable selling in the coming holiday week.

ELECTRICAL MATERIAL FOR BRAZILIAN GOVERNMENT.—There has been received by the Bureau of Foreign and Domestic Commerce a sample board containing samples of the various iron, steel and copper wires used by the Department of Telegraphs, Rio de Janeiro, Brazil, which it is necessary for the department to purchase abroad. Accompanying the board are three tracings of the posts that have been standardized by the Department of Telegraphs, one tracing of the arms and pins, and five photographs showing iron arms and fittings, wooden arms and fittings, porcelain insulators and pins, and miscellaneous tools. Up to the present time all the material except the wire, and the greater part of that, has been bought in Europe from firms that solicited the business through their connections in Rio de Janeiro, according to Philip S. Smith, who has recently returned from South America, where he was studying the market for electrical goods as special agent for the Bureau of Foreign and Domestic Commerce. The Brazilian Department of Telegraphs desires to purchase in the United States if it can obtain the material required, and an opportunity is thus afforded American firms interested to compete for business that heretofore has been closed to them. In taking this matter up it should be noted that the only condition under which dealings can be had with the Department of Telegraphs is that the manufacturer offering his goods be in a position to deal with the Brazilian government direct and not through agents or commission houses, so as to give the government the benefit of the customary terms of payment obtaining in ordinary business transactions. The samples, tracings and photographs may be seen at the New York office of the Bureau of Foreign and Domestic Commerce, Room 734, Custom House. Refer to file No. 40,134.

WORLD HOLIDAYS.—Under the title "Bank and Public Holidays Throughout the World" the Guarantee Trust Company of New York has printed a book which should be of considerable interest to concerns engaged in or proposing to engage in foreign trade.

ONE HUNDRED AND TWENTY THOUSAND FLOODLAMPS FOR PROTECTION.—More than 120,000 incandescent floodlighting projectors for series circuits are in use for the protection of government and other plants, according to a memorandum of the supply department of the New York office of the General Electric Company.

GERMAN ELECTRICAL MANUFACTURING DIVIDENDS.—That the German electrical manufacturers are not in such poor shape as might be supposed is borne out by the fact that the directors of the Allgemeine Elektricitäts Gesellschaft of Berlin estimate that the company will be able to pay 14 per cent dividend for 1917-1918 as compared with 12 per cent for the preceding year.

SYSTEMATIC USE OF MAZDA NUMBER.—Every regularly manufactured Mazda miniature lamp is now designated by a Mazda number. In ordering Mazda lamps the manufacturers are urging buyers to indicate this number. As a further step in standardizing the use of such numbers new carton labels have been designed and will be printed in black and red. Black labels indicate vacuum lamps and red labels indicate gas-filled lamps. These labels will be used on all cartons of regular Mazda miniature lamps and will be much more legible than the previously used rubber-stamp labels. Each label contains the number and the complete specification of lamps contained in the carton as well as the number of lamps contained. This feature, it is claimed, makes for greater convenience in taking inventories.

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THE DOMESTIC TUNGSTEN LAMP COMPANY, formerly at 575 Bergenline Avenue, West New York, N. J., has moved to 418-420 Tenth Street, that city.

PRESCOTT C. RITCHIE, Western representative of the Westinghouse automobile equipment department, moved his headquarters from Indianapolis to the Conway Building, Chicago, on Dec. 1.

THE CENTURY STORAGE BATTERY COMPANY, 948-950 East Jefferson Avenue, Detroit, Mich., is the new name and address of the Michigan Storage Battery Company, formerly of 57 Atwater Street.

THE AMERICAN LAVA COMPANY, Chattanooga, Tenn., a concern manufacturing among other things electric insulation, will to the extent of 800 shares of common stock of $100 par value be offered for sale at auction on Dec. 23 by the Alien Property Custodian.

ENGLISH RESTRICTIONS ON VACUUM CLEANERS LIFTED.—The controller of import restrictions of London, England, has temporarily suspended all import restrictions on vacuum cleaners. Prior to the war almost all vacuum cleaners sold in the market were of American manufacture.

THE McCLINTIC-MARSHALL CONSTRUCTION COMPANY, New York City, it is reported, has submitted the owest bid to the Navy Department for the construction of twenty steel radio towers at Monroe, N. C. The tenders were for a little over $2,000,000. Each tower is to be 820 ft. in height.

THE BUSHNELL ELECTRICAL COMPANY has recently taken over the business and assets of the L. B. Lincoln Electric Company of Chicago, with factory at Bushnell, Ill. The Bushnell Electric Company has moved the factory back to Chicago, and it will be temporarily at 1062 Glenlake Avenue, the former address of the L. B. Lincoln Electric Company.

THE SOUTHERN ELECTRIC SUPPLY COMPANY, 31 Peters Street, Atlanta, Ga., has been incorporated to conduct an electrical supply business and is an outgrowth of the National Telephone Supply & Development Company of Atlanta. R. L. Stewart is president of the company and Carl D. Boyd sales manager. Traveling salesmen will cover the states of Georgia, Florida, Alabama, North and South Carolina and portions of Mississippi and Tennessee. A catalog is being compiled which, it is understood, will be ready for distribution about Feb. 1, 1919.

RIEGEL BROTHERS, Spokane, Wash., distributers of Dodge automobiles and trucks, have taken the agency for the Lalley electric light and power plant.

THE AMERICAN TRANSFORMER COMPANY, Newark, N. J., has moved into its new and larger factory at 178-182 Emmet Street, just two blocks northeast of its former location.

THE STORAGE BATTERY COMPANY expects to build a garage for general electric truck and battery service at Boston in the coming year. It is expected that a structure of about 30,000 sq.ft. will be provided at first.

FRED G. BELL has resigned as sales manager of the Electro Dynamic Company, Bayonne, N. J. His present plans are to represent several well-known products through a sales agency in either the New York or the Philadelphia district.

THE CONLON ELECTRIC WASHER COMPANY, which supplies washing machines to the Western Electric Company, is preparing to build on the west side of Chicago a washing-machine factory which the company says will be as large as, if not larger than, any other in the Central West.

THE McKENNEY & WATERBURY COMPANY, Boston, has just received a number of good-sized fixture orders, including the equipment of the new Revere Sugar Refinery, Charlestown; the equipment for the Christian Science Benevolent Association, Brookline; that for the Commonwealth Golf Club, Chestnut Hill, and also for various high-class residences in Greater Boston.

THE CROUSE-HINDS COMPANY, Syracuse, N. Y., has recently opened a new industrial school at its plant for the use of its employees. It is understood that classes will be held three times a week for instruction in various branches. E. P. Fessinger, welfare manager of the Solvay Process Company, is chairman of the committee on instruction. Mr. Fessinger will be assisted by five teachers supplied by the Department of Public Instruction.

THE YARNALL-WARING COMPANY, manufacturer of power-plant devices, Philadelphia, has acquired a three-acre tract at Mermaid Lane and Devon Street, Chestnut Hill, Philadelphia, adjacent to the Mermaid Lane station, Chestnut Hill division of the Philadelphia & Reading Railway. The tract contains a three-story stone mansion which is being converted into general offices, and a one-story modern machine shop has been erected in which manufacturing is now being carried on.

C. A. HENDERSON has resigned as chief engineer of the Submarine Boat Corporation and is now established in New York, acting as chief engineer of the Hercules Engineering Corporation and president of the Electrolytic Engineering Corporation. Prior to being identified with the Submarine Boat Corporation, he was general manager of the Niagara Smelting Corporation at Niagara Falls and prior to that acted in various capacities with the Cutler-Hammer Company.

E. Y. STIMPSON of Boston has taken the agency in that district for the Ward electric commercial vehicle. Mr. Stimpson is well known in the New England electrical field and for several years has energetically represented the Detroit Electric Car Company at Boston. He will continue both representations, with headquarters on Commonwealth Avenue. Mr. Stimpson is highly optimistic as to the future of the electric vehicle within its field, and he reports an increasing demand for cars of all classifications. Factory shipments are now coming through well.

THE ROLLER-SMITH COMPANY, New York City, announces the promotion of N. Frankel, now manager of the Chicago office at 740 Monadnock Block, to the position of assistant sales manager. Mr. Frankel's headquarters will remain in Chicago, from which point he will supervise the activities of the Roller-Smith Company's Cleveland and Detroit offices as well as the Chicago office, of which he is now and for several years has been in charge. In addition, Mr. Frankel will have direct charge of all the company's automobile instrument business, including the states of Michigan, Ohio, Wisconsin, Illinois, Minnesota and parts of Pennsylvania and Iowa. His close familiarity with the Roller-Smith Company's products has been gained through his connection with the company for the past six years or more.

THE BOSCH MAGNETO COMPANY'S Springfield (Mass.) plant was sold at auction, with patent rights, Dec. 7, for $4,150,000, to H. C. Griffiths of 220 Fifth Avenue, New York. The sale included 250 shares of capital stock of the company listed at $100 par value. The price bid was subject to the approval of A. Mitchell Palmer, Custodian of Alien Enemy Property, who has been in charge of the factory for about a year. The plant was originally owned by interests exceedingly friendly to the former German Emperor. During the present year it has been engaged in intensified production and has furnished a large amount of equipment for the United States government's war requirements under the supervision of the federal authorities.

## Trade Publications

SALINE HEATER.—A recent mailing folder from Reid Brothers of Seattle, Wash., has for its subject the Thomas electric saline heater designed to replace hot-water bottles.

FLOOR-TYPE GRINDERS.—The Webster & Perks Tool Company, Springfield, Ohio, in Bulletins Nos. 9 and 10 gives specifications of its No. 1 and No. 1½ electrically driven ball-bearing floor-type grinders.

LIGHTING FIXTURES.—The Cincinnati Artistic Wrought Iron Works, 2941 Eastern Avenue, Cincinnati, Ohio, has distributed a catalog showing designs of lighting fixtures and accompanying wall brackets.

RADIO APPARATUS.—Catalog bulletins S-1, S-2, S-3 and T-1 of the Kilbourne & Clark Manufacturing Company, Seattle, Wash., have been issued. They deal with radio installations and apparatus and radio-telegraph apparatus.

LAMPS.—A statement of the advantages of Franklin Mazda lamps and pictures of buildings where they are installed make up a mailing folder now being sent out by the Franklin Electric Manufacturing Company of Hartford, Conn.

WIRE.—Asbestos and enamel insulated wire for switchboards, heaters, motion-picture machines and other uses is the topic of a new catalog issued by the Independent Lamp & Wire Company, 1737 Broadway, New York City.

HEATING DEVICES. — Pictures of homes, military camps, industrial and shipbuilding plants and other places where its electric heating devices are used have been printed in a broadside of the American Electrical Heater Company, Detroit, Mich.

FRESH-WATER SYSTEMS. — Dealing with fresh-water systems for use in farmhouses and other places where there is no running water system, a sixteen-page booklet has just been distributed by the United Pump & Power Company, Milwaukee, Wis.

FITTINGS.—Electrical boxes and conduit fittings, railway and other electrical appliances and water-tight fittings form the topic of an eighteen-page booklet prepared by the Trans-Com Lighting Products Corporation, 508 Broome Street, New York City.

TERMINAL LUGS.—An illustrated leaflet listing all sizes and styles of "Circle T" terminal lugs for front and back switch connections has been prepared by the Trumbull Electric Manufacturing Company of Plainville, Conn., and is known as Circular No. 33.

WATER HEATER.—The advantages of the "Therm-Elect" immersion and circulation water heaters for attachment to kitchen boilers without extra plumbing are set forth in a two-color leaflet with illustrations issued by the Electric Sales Service Company, 109 Stevenson Street, San Francisco.

HEATING AND COOKING APPLIANCES.—"Westinghouse Electric Ware" is the title of the twenty-five page catalog section 8-C published by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., to tell about its radiators, heaters, irons and table appliances. Prices and illustrations are included in the catalog.

HEATING UNITS.—Many uses of its standardized heating units are given in a four-page pamphlet prepared by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis. A blue-print accompanying the pamphlet gives dimensions of the units which may be used on either aternating current or direct current in all kinds of factories, industrial plants and other places where electric heat is required.

LIST OF INSPECTED MECHANICAL APPLIANCES.—The Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago, maintained by the National Board of Fire Underwriters, have issued a list of the mechanical appliances inspected by these laboratories. The appliances are grouped according to types with the labels used illustrated in original colors. Manufacturers' names and addresses are given together with a brief description of the apparatus.

SMALL TOOLS.—Catalog No. 40 is a new 288-page publication of the small-tool division of the Greenfield Tap & Die Corporation, Greenfield, Mass. Superseding catalog No. 37, the new catalog, which is well illustrated, gives descriptions and prices on taps and dies, screw plates and reamers as well as containing a number of pages of useful information and tables. While this catalog is about 4¾ in. by 7¼ in., a pocket edition is being supplied to jobbers and dealers for general trade distribution.

ELECTRICAL SUPPLIES.—The Watmore-Savage Company, Boston, has recently issued a new catalog of electrical supplies, numbered 16 in the company's series and comprising 1408 pages. A large number of engineering data are included in the catalog with the listings, and at the end of the book are printed standard wiring symbols, units of measure, equivalent values in different units, wire tables, pulley and gear data, motor tables, comparisons of thermometers, general wiring and transmission formulas, and wiring data for three-phase motors. A thumb index is provided to facilitate the use of the catalog.

## New Incorporations

THE FRANKLIN COUNTY POWER COMPANY of Little Falls, N. Y., has been incorporated with a capital stock of $60,000, by A. H. McCann, H. S. Lavery and P. S. McCaghey of Little Falls.

THE NEW JERSEY LAMP COMPANY, 4 Paterson Street, Hoboken, N. J., has been organized to manufacture electric lamps. Nathan Wise, 368 Broome Street, New York, N. Y., is interested in the company.

THE SOMERSET ELECTRICAL COMPANY of Philadelphia, Pa., has been incorporated with a capital stock of $10,000 to manufacture electrical specialties by Roy L. Crover and associates.

THE MAGNOLIA (DEL.) ELECTRIC LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000 by John B. Lindale, James Martin and George W. Collins, all of Magnolia.

THE SCHWEYER ELECTRIC & MANUFACTURING COMPANY of Easton, Pa., has been chartered with a capital stock of $100,000 to manufacture electrical equipment. Alvin H. Butz of Allentown is treasurer.

THE PROFESSIONAL X-RAY LABORATORIES COMPANY of Brooklyn, N. Y., has been chartered with a capital stock of $10,000 by J. A. Trimble, R. A. Barton and H. McGrath, 2218 Eighty-fourth Street, Brooklyn, N. Y.

THE EUREKA MANUFACTURING COMPANY of Cleveland, Ohio, has been incorporated with a capital stock of $10,000 by L. N. McShane, T. C. Lawless, C. M. White, A. B. Curtuss and N. J. Brewer. The company proposes to manufacture and deal in electrical machinery.

THE VICTOR WATER MOTOR CORPORATION of New York, N. Y., has been incorporated by A. F. Andrews, A. and V. Prager, 419 West 129th Street. The company is capitalized at $25,000 and proposes to manufacture hydraulic motors, engines and power-generating machinery.

THE HUTCHINSON STORAGE BATTERY COMPANY of Trenton, N. J., has been incorporated by John E. Hutchinson, Roy Skelley and Herbert F. Backes. The company is capitalized at $50,000 and will take over the business operated under this name at 230 South Warren Street.

THE RATIOMETER CORPORATION of Rochester, N. Y., has been incorporated by I. Lungaard, Landing Road, Brighton; L. P. Willsea, 175 Seneca Parkway, Rochester, and W. K. Smith, 818 Dewey Avenue, Rochester. The company is capitalized at 25,000 and proposes to manufacture machinery, boilers, engines, motors, feeding and adjusting mechanism meters, etc.

## New England States

BOSTON, MASS.—Plans for establishing a new machine shop at the Charlestown Navy Yard, for which an appropriation of $900,000 was set aside, it is reported, will be carried through.

BROCKTON, MASS.—Work has begun on the installation of the new street lamps to replace the present lighting system, under the terms of the new contract entered into a year ago with the Edison Electric Illuminating Company. The lamps have been delayed owing to war-time conditions. On the outlying streets 60-cp. nitrogen lamps will be used to replace the 16-cp. lamps now in use. Most of the large lamps will be of 600 cp. About 314 large lamps will be installed, replacing 206 arc lamps. The ornamental lamps will be of 1000 cp. mounted in crystal globes on standards similar to those used for the lighting system at the Panama-Pacific Exposition in San Francisco, which will be installed as soon as war-time restrictions are removed. This may be six months or more.

MARLBORO, MASS.—Work on the construction of a power house, to cost about $20,000, and manufacturing building, to cost about $30,000, for the Koehler Manufacturing Company of Marlboro, it is understood, will be suspended for the winter.

TURNERS FALLS, MASS.—Further important changes, it is announced, are to be made to increase the power resources of the Turners Falls Power & Electric Company. It is proposed to raise the entire canal wall and the embankments to a height of 2 ft. This will greatly increase the amount of water delivered to the wheels from the Connecticut River. The company will enlarge the capacity of the Montague City power house in proportion. The present capacity of the power house is 48,000 kw. daily. Engineering work in connection with the project has been completed, and it is expected that the contract will be let in the spring.

WEBSTER, MASS.—Preparations are being made by the Webster & Southbridge Gas & Electric Company to install a 5000-hp. turbine as a reserve in the new section of its plant, which, it is expected, will be completed early in January.

WORCESTER, MASS.—Plans are being prepared by Frost & Chamberlain, architects, 390 Main Street, for the erection of a trade school for girls on High and Chatham Streets, to cost about $200,000. L. E. Buckley is trustee.

LEESVILLE, CONN.—Bids, it is understood, will soon be asked by the Central Connecticut Power & Light Company of East Hampton for construction of addition to power house on Salmon River, to cost about $26,000. C. P. Perry of East Hampton is engineer.

NEW HAVEN, CONN.—The merchants and residents on Grand Avenue beyond Railroad Avenue have petitioned the Board of Aldermen to extend the ornamental lamps on that thoroughfare from the railroad crossing to the Quinnipiac River.

NEW HAVEN, CONN.—The New York, New Haven & Hartford Railroad Company, it is reported, has awarded contract for changing the power in the classification yards in the Cedar Hill district from steam to electricity. The electric system will probably be extended as far as East Haven in the Cedar Hill district and to the North Haven station on the Hartford division.

## Middle Atlantic States

BROOKLYN, N. Y.—Contract has been awarded by Beswick Brothers, 272 Kent Avenue, manufacturers of electrical appliances, etc., to Richard D. Von Lehne Sons, 2701 Avenue G, for construction of an addition to their plant on Erasmus Street, near Lott Street.

BUFFALO, N. Y.—Plans have been prepared by the Delaware, Lackawanna & Western Railroad Company for the construction of a machine shop, 135 ft. by 659 ft., one story, at East Buffalo, to cost about $100,000. G. J. Ray of Hoboken, N. J., is chief engineer.

NEW YORK, N. Y.—The New York Central Railroad Company, Grand Central Terminal, is considering the construction of a new engine plant at Lake Tupper.

NEW YORK, N. Y.—Arrangements are being made by the Lion Brewery, Columbus Avenue and 108th Street, for converting two floors of its building into an ice-manufacturing plant. Electrical equipment and ice-manufacturing machinery, to cost about $100,000, will be installed. Friedmann, Robertson & Keeler, 90 West Street, are engineers.

# *Construction*

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

BAYONNE, N. J.—The City Commissioners have instructed James Benny, city attorney, to ascertain what steps can be taken by the city to acquire and operate a municipal lighting plant and what could be done by the city in acquiring the lighting system of the Public Service Electric Company in Bayonne.

JERSEY CITY, N. J.—Bids will be received by the Hudson County Boulevard Commissioners, Jersey City, until Dec. 27 for furnishing and installing one 90-kw., 60-cycle, 2300-volt generator; one 2½-kw., 125-volt alternator exciter, directly connected; one blue Vermont marble switchboard for 125 kva., two-phase, 60-cycle, 2400-volt generator; one blue Vermont marble exciter panel with ammeter, main switch, hand wheel for controlling exciter, rheostats mounted on pipe supports to line up with generator panel; one blue Vermont marble constant-current transformer panel controlling two 2200-volt, 30-kw. transformers, equipped with two primary ammeters, secondary plug switch receptacles mounted on pipe supports for connection to transformers they control, but not necessary to line up with generator panel, etc. C. Van Keuren is city engineer.

NEWARK, N. J.—The Board of Education has engaged John H. and Wilson C. Ely, Fireman's Building, architects, to prepare plans for the proposed new industrial school, to cost about $400,000. The building will be 170 ft. by 225 ft., three and four stories, and will be provided with machine shop, metal-working and other industrial departments.

NUTLEY, N. J.—The Town Commission is considering the installation of new street lamps of larger candlepower.

PATERSON, N. J.—Plans are under consideration by the City Council for improvements to the street-lighting system on a number of streets in various sections of the city.

PERTH AMBOY, N. J.—Contract has been awarded by the Water Board for the erection of a new pumping station at South River, to cost about $14,850.

BROCKWAYVILLE, PA.—Plans are under consideration by the Erie Railroad Company of Jersey City for the construction of a new engine terminal at Brockwayville, to include machine shop, engine shop, power house and other buildings.

MILTON, PA.—Announcement has been made by the War Department, Washington, D. C., that work has been abandoned on the construction of the proposed power plant in Milton.

PHILADELPHIA, PA.—The Department of City Transit is planning the construction of twelve passenger stations, 20 ft. by 60 ft., to cost about $15,000 each, on the new Frankford Elevated Railway.

PHILADELPHIA, PA.—Contract has been awarded to William H. Eddleman & Sons, 453 Green Lane, Roxborough, for the proposed improvements to the engine plant and dye house of the Freeland Manufacturing Company, Freeland Street and Walnut Lane.

PITTSBURGH, PA.—The West Penn Power Company has authorized an issue of $3,000,000 in bonds, the proceeds to be used to increase its generating, transmission and distribution systems.

PITTSBURGH, PA.—The Duquesne Light Company has announced that the construction of the proposed addition to its power station on Brunots Island, near Pittsburgh, has been indefinitely postponed.

PITTSBURGH, PA.—Plans have been prepared by the Union Steel Casting Company for the construction of a new crane runway, to cost about $22,000, to provide for the operation of an electric traveling crane.

READING, PA.—Plans are under consideration by the Carpenter Steel Company for the construction of a power plant, 60 ft. by 175 ft., on the River Road, to cost about $110,000. The plant will have a capacity of about 2500 hp. and will be driven by steam power. The company will also erect a one-story shop, 30 ft. by 40 ft., to be used for steel-clipping operations.

BALTIMORE, MD.—The Magneto & Machine Company, 1034 Cathedral Street, is considering the construction of a new machine shop.

CHARLESTON, W. VA.—The Eagle Gas Coal Company has recently installed a new power plant.

CHARLESTON, W. VA.—The New River Company is erecting a power house at its Cranberry mine and a substation at its Sprague works. S. A. Scott with headquarters at Mount Hope and Macdonald is general manager.

WHEELING, W. VA.—The Council has approved the contract awarded to the Steam Electric Company for the installation of new equipment at the Nineteenth Street substation.

HAMPTON ROADS, VA.—The power plant at the local navy yard was destroyed by fire on Dec. 10, causing a loss of about $50,000.

RICHMOND, VA.—The Virginia Railway Power Company is reported to be considering the construction of a large dam at the falls of the Appomattox River for the purpose of developing the water power there and supplying electricity for lamps and motors in tidewater cities of eastern Virginia, including Richmond. The cost of the work is estimated at $2,000,000, and it is intended to secure the aid of the federal government.

## North Central States

BAY CITY, MICH.—Ground has been broken for the erection of a machine shop for the Industrial Works in Bay City, to cost about $125,000. The company manufactures cranes.

DETROIT, MICH.—Plans are under consideration by the Central Forge Company, Euclid Avenue, for early resumption of construction on the extension of its forge shop and heat-treatment building, foundations for which have been completed. The cost is estimated at $200,000.

CINCINNATI, OHIO. — The National Biscuit Company, it is reported, contemplates the erection of a large baking plant, to cost about $1,500,000.

CLEVELAND, OHIO—The United States Copper Products Corporation of Cleveland, recently incorporated with a capital stock of $1,500,000, it is reported, will soon begin the construction of a plant for the manufacture of brass and copper seamless tubes. The company has acquired a 25-acre site at West Seventy-third Street and the Wheeling & Lake Erie Railroad, on which it will erect the proposed plant. The equipment will consist of three electric melting furnaces, a copper-refining furnace for refining scrap, brass and copper for its own use, about forty crucibles, a tube mill and three electric traveling cranes. The initial installation will have a capacity of about 20 tons per day and will cost about $600,000. Orders for equipment, it is understood, will soon be placed. E. I. Heinsohn is president and general manager.

MASSILLON, OHIO.—The Massillon Gas & Electric Company has awarded general contract for construction of an addition to its power plant to the Republic Construction Company.

PIQUA, OHIO—The French Oil Machinery Company has engaged J. J. Wernette, engineer, to prepare plans for a new power plant at its works.

MANCHESTER, KY.—The Columbian-Panama Coal Company, it is reported, is considering plans for the construction of a power plant at its local properties.

TERRE HAUTE, IND.—The George A. Fuller Construction Company, 175 Fifth Avenue, New York, N. Y., has been awarded contract for the construction of a new repair plant for the Pennsylvania Railroad Company, which will include a car repair shop, machine shop, planing mill, paint shop, material warehouses, extension to roundhouse and other buildings, and also an extension to power house. The cost of the work is estimated at about $250,000.

CHICAGO, ILL.—The Edison Electric Appliance Company, 5660 West Taylor Street, Chicago, has been granted a permit for the erection of a one-story factory, 101 ft. by 147 ft., to cost about $40,000.

CHICAGO, ILL.—The Edward Katzinger Company has purchased a site at the corner of Washington and Sangamon Streets on which it proposes to erect a seven-story factory building, to cost about $250,000.

CHICAGO, ILL.—The Consumers' Packing Company, 11 South LaSalle Street, has awarded the entire contract for the erection of a packing plant, to be erected at 1400-1426 West Forty-sixth Street, including refrigerator, cold-storage and power buildings with all appurtenances, to cost about $500,000, to the Salamon-Waterton Company, 1343 South Dearborn Street.

CHICAGO, ILL.—The electrification of all its lines in Chicago and the early construction of a large passenger terminal has been agreed upon by representatives of the Illinois Central Railroad Company and attorneys for the city of Chicago. The equipping of the lines for electrical operation, it is stated, will take place in three periods of approximately five years each. First the suburban service will be electrified, then the through service and finally freight lines.

DURAND, ILL.—Application has been made to the Public Utilities Commission by the Citizens' Utilities Company of Durand for a certificate of convenience to supply electricity for lamps and motors in Durand, Davis, Rock City and Dakota. The company is capitalized at $40,000 and proposes to purchase the utility plant, in Durand, Dakota and Davis. J. F. Harris is reported interested in the company.

GALESVILLE, WIS.—The Davis Mill Company is contemplating building an addition to its power house and installing a 100-hp. engine. B. W. Davis is manager.

JANESVILLE, WIS.—The City Council has engaged J. C. Jacobsen, consulting engineer, First National-Soo Building, Minneapolis, Minn., to prepare tentative plans and estimates for extensions to the municipal hydroelectric generating plant and the auxiliary steam generating plant. C. V. Kerch is city engineer.

MENASHA, WIS.—Contract has been awarded by the Gilbert Paper Company of Menasha for the construction of an addition to mill and power plant, 97 ft. by 100 ft., with brick smokestack, 150 ft. high, to C. R. Meyer & Sons Company of Oshkosh.

OSHKOSH, WIS.—The capital stock of the Universal Motor Company has been increased from $50,000 to $100,000. The company manufactures direct-connected generating systems.

RACINE, WIS.—Plans are now being perfected for rebuilding the plant of the Maibohm Motors Company, recently damaged by fire. The loss of machinery, stock, etc., is estimated at $250,000, and that on buildings at $50,000. The company manufactures passenger automobiles. H. C. Maibohm is president.

SUPERIOR, WIS.—The Benson Electric Company of Superior has been awarded contract by the United States government to manufacture electric steering and signal systems and devices for the Emergency Fleet Corporation. The company, it is understood, will add another story to its main shop at once. M. B. Benson is president.

SUPERIOR, WIS.—Wallin & Johnson, promoters of the Lakeside colony near Maple, have submitted a proposal to Mayor Baxter offering to deliver electricity at a central transformer station in Superior for distribution by the city. The company states that it owns a power site east of the city which it proposes to develop, provided that a contract can be obtained for sale of energy for a number of years.

SLAYTON, MINN.—The Slayton Power Company will install a 75-kw. additional steam unit and will put in a steam-heating system in the village, to be completed in time for the 1919 heating season. F. D. Eddy is manager.

DES MOINES, IOWA.—Plans are being considered by the Advance Rumley Thresher Company for the construction of a factory and warehouse, to cost about $125,000.

NEOLA, IOWA.—The Town Council has authorized an issue of $10,000 in electric light bonds.

KANSAS CITY, MO.—Work has started on remodeling the ice-storage plant of the City Ice & Storage Company at 4832-42 Oak Street. The cost is estimated at $50,000.

KANSAS CITY, MO.—The lighting system for the Missouri side of the Inter-City Viaduct has been awarded by the Board of Public Works to the Kansas City Light & Power Company. The plans call for fifty-four lamps of 100 cp. each erected on 20-ft. poles.

MARSHALL, MO.—Plans are being prepared for the installation of an electric light plant in connection with the present waterworks system to cost about $75,000. The equipment will probably include one 150-kw. and one 250-kw. generator (steam-driven), one boiler, switchboards, pole-line materials, etc. Bids, it is understood, will be asked early in January. Henrici-Lowry, Commerce Building, Kansas City, Mo., are engineers.

ST. LOUIS, MO.—The City Council contemplates an issue of $200,000 in bonds for the construction of a new fire house, to cost about $200,000, for which preliminary plans have been prepared. L. R. Bowen, City Hall, is engineer.

SEDALIA, MO.—The City Light & Traction Company is planning to install a 1000-kw. General Electric turbine at its power house in the near future.

GLYNDON, N. D.—Arrangements are under way for the purchase of the electric light plant of the Glyndon Light Company, to be owned and operated by the municipality.

BURWELL, NEB.—The city of Burwell has sold $13,500 in electric light bonds.

ABILENE, KAN.—The Riverside Light, Power & Gas Company has taken over the property of the Kaw Valley Tranmission Company of St. George, in Pottawatomie County, which supplies electrical service in the town and for about forty rural homes. This service will now be supplied from the Abilene and Rocky Ford power plants. The company is also completing other extensions to Louisville, Westmoreland and Waunaunsee County.

DOWNS, KAN.—At an election to be held Dec. 17 the proposal to issue $40,000 in bonds for the construction of a municipal electric light plant in Downs will be submitted to the voters.

HIAWATHA, KAN.—Plans are under consideration for the installation of pumps at spring on the county farm and to extend the transmission line and connect with the city system. An election will probably be called soon to submit the proposal to issue from $20,000 to $25,000 in bonds for the project.

KANSAS CITY, KAN.—The Fogel Construction Company, Reliance Building, has been awarded general contract for the construction of a power house for Wilson & Company, Osage and Adams Streets, 50 ft. by 60 ft.

## Southern States

ROCK HILL, S. C.—Plans have been prepared by Edwards & Sayward, Chamber of Commerce, Atlanta, Ga., for the construction of dormitory buildings and students' building at Winthrop College. An appropriation of $100,000 has been made for each building. W. P. Goodman of Rock Hill is manager of construction.

COLUMBUS, GA.—A 7500-kw. steam turbine and two 600-hp. boilers are being installed in the plant of the Columbus Power Company. Further extension of the boiler room and the installation of two additional 600-hp. boilers are also under way.

FAIRFIELD, ALA.—Plans are under way for the construction of an electric plant by the Fairfield Utilities Company, reecntly organized with a capital stock of $50,000. The company, it is understood, also proposes to establish water, gas and street-car service in Fairfield. George Gordon Crawford, president of the Tennessee Coal, Iron & Railroad Company, is president of the Fairfield company.

BAY ST. LOUIS, MISS.—Arrangements have been made by the cities of New Orleans, La., and Mobile, Ala., for the holding of a conference at Bay St. Louis early in January to consider preliminary plans for the construction of a new electric interurban railway between the two municipalities. In connection with the proposed project hydroelectric plants will be established to supply power to operate the system.

INVERNESS, MISS.—Bids will be received by the Mayor and Board of Aldermen, Inverness, until Jan. 2, for improvements to the water and light plant, including oil engines, pumps, alternators and miscellaneous line material, cast-iron and galvanized pipe, valves and hydrants and reservoir. Specifications, form of proposal, contract and plans may be seen at the office of the Mayor and Board of Aldermen, Inverness, and specifications will be mailed upon application to Xavier A. Kramer, engineer, Magnolia.

MERIDIAN, MISS. — The Mississippi Fiber Company is considering the purchase of power plant and fiber-handling machinery. The company contemplates changing its plant into an absorbent cotton factory.

TUTWILER, MISS.—Bids will be received by the city of Tutwiler until Dec. 30 for the construction of a municipal electric light plant. Bonds to the amount of $8,000 have been issued for the proposed plant.

DALLAS, TEX.—Work has begun on erecting the transmission line preparatory to the installation of the 900 new street lamps to be erected in various parts of the city.

ORANGE, TEX.—The National Shipbuilding Company is contemplating the installation of an electric power plant at its local yards.

PHARR, TEX. — The Louisiana-Rio Grande Canal Company is contemplating extensions to its irrigation system, involving an expenditure of about $175,000. Additional pumps and other equipment will be installed.

## Pacific and Mountain States

IMPERIAL, CAL.—The local power station of the Holton Power Company was recently damaged by fire, causing a loss of about $10,000.

RAYMOND, WASH.—The residents of Willapa have petitioned the Willapa Electric Company to establish an automobile line between Willapa and Raymond temporarily and later to extend its electric railway to that city.

BOISE, IDAHO.—A syndicate composed of Herbert Lemp, the Idaho Packing Company, the Davis Meat Company, the Boise Valley Packing Company and Ernest A. Evans is contemplating the construction of a packing plant, to cost about $1,500,000, in Boise.

SELIGMAN, ARIZ.—Steps have been taken to organize the Mojave Northern Power Company for the purpose of building and operating the proposed hydroelectric development on the Colorado River north of Seligman and Williams. The company will be capitalized at $24,000,000. Surveys have been made for the proposed plant. E. L. Beyard is interested in the project.

BUTTE, MONT.—The Mountain States Telephone & Telegraph Company is contemplating extensions in South Butte, involving an expenditure of about $30,000.

CARLSBAD, N. M.—The power plant of the Carlsbad Light & Power Company was recently damaged by fire, causing a loss of about $20,000. The plant, it is understood, will be rebuilt.

## Canada

INGERSOLL, ONT.—Plans are being prepared by the Ingersoll Rolling Mills Company for an addition to its plant, to cost about $200,000.

SARNIA, ONT.—The Council is considering improvements and additions to the waterworks plant, including the installation of a motor-driven sludge pump, to cost about $10,000. H. F. Hall is engineer.

TORONTO, ONT.—Plans have been prepared by the Toronto & York Radial Railway Company for the construction of a carhouse on Kingston Road, Toronto for the Scarboro division.

TORONTO, ONT.—Tenders will be received by R. C. Desrochers, secretary of the Department of Public Works, Ottawa, until Dec. 24, for construction of boiler house, power plant, garage and mortuary for the military hospitals at St. Andrews, Toronto, Ont. Plans and specifications can be seen and form of tender obtained at the office of the chief architect, Department of Public Works, Ottawa; the clerk of works, Postal Station "F," Toronto, and the superintendent of military hospitals, Toronto.

CHARLEMAGNE, QUE.—La Minotérie Moderne, Ltd., recently organized with a capital stock of $20,000, proposes to take over the stock of Laurin & Frère of Charlemagne and to develop water power in the counties of L'Assumption, Montcalm and Joliette.

SHAWINIGAN FALLS, QUE. — The Shawinigan Water & Power Company is considering a hydroelectric development at Gres Falls on the St. Maurice River, to cost about $1,000,000. The company is planning to rebuild, immediately, its shops, recently destroyed by fire. The loss is estimated at $25,000.

## Miscellaneous

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Dec. 28 for subterranean cable, copper, copper pipe and tubing cable thimbles, steam gages, etc. Blanks and information relating to this circular (1248) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York City; 668 Common Street, New Orleans, La., and Fort Mason, San Francisco, Cal.

# Record of Electrical Patents

Notes on United States Patents

(Issued Nov. 12, 1918)

1,284,502. FLASHLAMP; Clinton E. Walton, Livingston, Mont. App. filed Aug. 31, 1917. May be supported from a suitable portion of a garment or may be attached to vehicles of different kinds.

1,284,533. TELEPHONE EXCHANGE SYSTEM; Joseph L. Wright, Cleveland, Ohio. App. filed Sept. 24, 1914. To provide improved means for effecting connection between calling lines and trunks in automatic systems.

1,284,552. ARMATURE INSULATION; Vincent G. Apple, Dayton, Ohio. App. filed March 21, 1918. A durable, tough, single-piece insulating structure or jacket for conducting wires or parallel conducting bars that are to be contained in the same slot or orifice.

1,284,554. ELEVATOR EQUIPMENT; Wesley Armstrong, North Battleford, Saskatchewan, Canada. App. filed Feb. 28, 1918. The doors opening into the elevator shaft may be secured against opening except when the floor of the car is level with one of the floors.

1,284,564. ELECTRICAL RECEPTACLE; Reuben B. Benjamin, Chicago, Ill. App. filed Oct. 16, 1917. Means for holding a lamp base in position and to prevent it from becoming accidentally unscrewed.

1,284,573. REGULATOR FOR DYNAMO-ELECTRIC MACHINES; Clarence A. Boddie, Pittsburgh, Pa. App. filed April 12, 1918. Regulation is effected by rapidly opening and closing a circuit in shunt to a resistor that is connected in series with the field-magnet winding.

1,284,574. ELECTRICAL REGULATING SYSTEM; Clarence A. Boddie, Pittsburgh, Pa. App. filed April 12, 1916. A quickly and accurately responsive regulator having a range that is not limited by the residual magnetism of the dynamo-electric machine.

1,284,604. SPEED-CONTROLLED GAS CUT-OFF FOR MOTOR VEHICLES; James H. Core, Nashville, Tenn. App. filed Oct. 4, 1917. Means for checking the movements of motor vehicles, and particularly speed-controlled means for cutting off the gas supply of such vehicles.

1,284,609. PROTECTIVE DEVICE; Elmer E. F. Creighton, Schenectady, N. Y. App. filed Jan. 13, 1914. Indication and detection of high-frequency disturbances or other overvoltage phenomena upon electrical transmission lines.

1,284,616. SYSTEM OF ELECTRICAL REGULATION; Guy E. Ditzler and John F. Stender, Chicago, Ill. App. filed Aug. 12, 1915. For regulating the current output of a variable-speed electric generator when used in connection with a secondary battery.

1,284,618. PROCESS OF AND APPARATUS FOR ELECTROLYTIC PRODUCTION OF CAUSTIC ALKALI; Herbert H. Dow, Midland, Mich. App. filed Aug. 12, 1915. The liquid effluent may be obtained in a more pure state and with fewer by-products and impurities than heretofore.

1,284,623. TELEPHONIC RECORDING AND REPRODUCING APPARATUS; Henry C. Egerton, Passaic, N. J. App. filed Feb. 1, 1918. Apparatus to produce a record of matter telephonically transmitted and to reproduce telephonically matter previously recorded.

1,284,629. COMBINED CHOKE COIL AND FUSE; John L. Fay, St. Louis, Mo. App. filed April 19, 1918. To provide a combined choke coil and fuse which can be easily and cheaply manufactured.

1,284,648. MANUFACTURE OF INCANDESCENT LAMPS; Frederic W. Gill, Arlington, N. J. App. filed June 29, 1915. To introduce necessary gases in such small quantities that globe is not discolored.

1,284,645. PROCESS OF MAKING FERROSILICON; George C. Furness, New York, N. Y. App. filed March 26, 1918. Relates to the preparation or compounding of the charge to be smelted.

1,284,649. AUTOMATIC TEMPERATURE CONTROL FOR ELECTRIC IRONS; Shirley L. Goldsbrough, Salt Lake City, Utah. App. filed Dec. 29, 1917. To provide a temperature regulator for flatirons.

1,284,660. ADAPTER FOR IGNITION SYSTEMS; John A. Hall, East Orange, N. J. App. filed Oct. 9, 1915. The conversion of ignition systems in which no master vibrator is used into systems in which a master vibrator may be used.

1,284,664. MOTOR VEHICLE; Alfred N. Hamrick, Silt, Col. App. filed Jan. 10, 1916. Employing a dynamo and means for operating the same to generate electric energy for use in a motor which is normally adapted to rotate the traction axle.

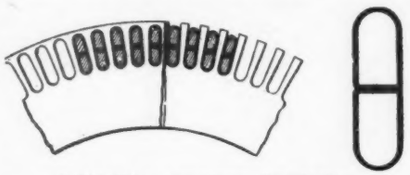
1,284,672. AUTOMATIC SWITCH; Charles J. Hendrickson, New York, N. Y. App. filed Dec. 29, 1916. Switches in which the power for imparting motion to the brushes is supplied by the action of a plunger and a solenoid.

1,284,707. ELECTRICAL STORAGE SYSTEM; Charles F. Kettering, Dayton, Ohio. App. filed April 17, 1911. Controlling apparatus for regulating the storage of electrical current in storage batteries.

1,284,715. DAMPER REGULATOR; William A. Lacke, Chicago, Ill. App. filed Feb. 23, 1917. Thermostatically controlled electric motor devices for opening and closing the damper of a furnace.

1,284,726. STORAGE-BATTERY CONSTRUCTION; William Morrison, Chicago, Ill. App. filed Feb. 16, 1918. To make batteries less subject to injury when used with vehicles.

1,284,730. PARTY-LINE RINGING SYSTEM; Alben E. Lundell, New York, N. Y. App. filed June 17, 1916. Automatic switches



1,284,552—Armature Insulation

are employed wholly or in part for the purpose of establishing a connection between the calling and the called line.

1,284,732. ELECTRICAL CONTROLLING SYSTEM; Arthur C. Magrath, Brooklyn, N. Y. App. filed June 22, 1916. An electromagnetic braking means which serves to retard the motion of the movable parts of an automatic switch.

1,284,735. VARIABLE SWITCH MECHANISM; Lewis A. Mapel, St. Louis, Mo. App. filed July 11, 1917. Under control of a float element.

1,284,736. SIGNAL-TRANSMITTING DEVICE; Frank M. Marshall, Los Angeles, Cal. App. filed Oct. 25, 1916. To simplify controlling means for automatic signal transmitters.

1,284,742. AUTOMATIC SWITCH; James L. McQuarrie, Montclair, N. J. App. filed Aug. 29, 1916. Simplicity of structure and operation is attained.

1,284,743. MEANS FOR SEGREGATING CURRENTS OF DIFFERENT FREQUENCIES IN ELECTRICITY-CONDUCTING SYSTEM; Louis T. Merwin and Roy K. Freeman, Portland, Ore. App. filed Aug. 31, 1915. For conducting along individual paths certain selected frequencies present in the circuit of an alternating or pulsating electrical current.

1,284,782. ELECTRIC DUMB-WAITER-CONTROL SYSTEM; Harold Rowntree, Kenilworth, Ill. App. filed Feb. 9, 1915. For use in connection with any type of electrically operated dumb-waiter hoisting mechanism.

1,284,798. CONTROL SYSTEM; Karl A. Simmon, Edgewood Park, Pa. App. filed Oct. 6, 1915. For the control of railway or vehicle motors; embodying independent unit swithces and master controllers.

1,284,799. KNOB AND THE LIKE; Lambert J. Sindelar, Howell, Neb. App. filed March 22, 1917. A knob and similar appliances for securing electric wires to suitable supports such as houses; device is simple in construction and operation.

1,284,823. TELEPHONE SYSTEM; Horace W. Ulrich, East Orange, N. J. App. filed March 30, 1918. Relates to systems in which are employed line or trunk circuits terminating at a central office and provided with line signals.

1,284,831. APPARATUS FOR CONTROLLING COMMUTATING-FIELD STRENGTH OF DOUBLE-COMMUTATOR MACHINES; Miles Walker, Manchester, Eng. App. filed Sept. 30, 1916. Each commutator cylinder is provided with a suitable brush gear, the two brush gears being rigidly connected so that both may be rocked together.

1,284,846. MEANS FOR MEASURING ELECTRICAL ENERGY; John C. Wilson, Milwaukee, Wis. App. filed May 24, 1917. Provides a method of compensating or correcting a wattmeter used for measuring the energy consumed in varying loads.

1,284,849. TIME-LIMIT RELAY; Albert Aichele, Baden, Switzerland. App. filed Dec. 30, 1916. To protect relays from effects of short circuits.

1,284,866. REGULATING SYSTEM FOR DYNAMO-ELECTRIC MACHINES; Clarence A. Boddie, Pittsburgh, Pa. App. filed April 12, 1916. Regulation is effected by rapidly opening and closing a circuit in shunt to a resistor that is connected in series with the field-magnet winding.

1,284,872. MAGNETIC SEPARATOR FOR SORTING HETEROGENEOUS MATERIAL; Daniel R. Bryan, Chatham, N. J. App. filed May 29, 1914. Will recover all the magnetic particles held in suspension in the dust which in present practice are carried away.

1,284,885. MEANS FOR CONTROLLING THE SPEED OF A MACHINE; Charles S. Franklin, London, Eng. App. filed April 7, 1916. For keeping constant the speed of any machine which it is desired to run at a particular speed by the use of a synchroscope.

1,284,891. ELECTROMAGNET; William H. Greenlead, Hartford, Conn. App. filed Oct. 16, 1916. Of particular utility when incorporated in or forming part of a timepiece.

1,284,924. AUTOMATIC PARTY-LINE TELEPHONE SYSTEM; Arthur L. Piper, San Francisco, Cal. App. filed Sept. 20, 1913. To signal the stations on the party line selectively.

1,284,930. ELECTRICAL HAMMER AND STONE CUTTER; John J. Roberts, Louisville, Ky. App. filed Aug. 17, 1915. Means for operating and controlling solenoid magnets through automatic and manually controlled electrical switches.

1,284,937. CIRCUIT CONTROLLER; Arthur Simon, Milwaukee, Wis. App. filed Aug. 30, 1915. A simple, efficient and sensitive controlling mechanism which may be readily adjusted to meet different requirements.

1,284,950. AUTOMATIC ELECTRIC FIRE ALARM; Jacob W. Wahl, New York, N. Y. App. filed March 13, 1915. A thermostatic arrangement which is simple and readily assembled.

1,284,956. FLEXIBLE CONDUIT; George W. Emrick, Brooklyn, N. Y. App. filed Feb. 28, 1917. A conduit of simple and inexpensive construction which is strong and durable.

(Issued Nov. 19, 1918)

1,284,957. SIGNAL BELL; Beryl W. Adams, Troy, Mont. App. filed Oct. 20, 1916. To give high-speed single strokes on alternating current.

1,284,966. ELECTRICAL INSTRUMENT; Charles T. Anderson, Edgewood Borough, Pa. App. filed Aug. 14, 1917. For keeping two or more contact fingers mounted on a common support in alignment for relays, etc.

1,284,974. STRAIN INSULATOR; Arthur O. Austin, Barberton, Ohio. App. filed May 24, 1916. For connecting insulating units together and to strain wires or supports.

1,284,975. STANDARD INSULATOR AND METHOD OF MAKING THE SAME; Arthur O. Austin, Barberton, Ohio. App. filed May 29, 1916. Multiplicity of projections on cementing surface aid in attachment.

1,284,976. INSULATOR; Arthur O. Austin, Barberton, Ohio. App. filed May 29, 1916. Any stress or strain due to unequal expansion or contraction of the insulator parts may be relieved without breaking the insulating member or causing an actual separation of the insulator parts.

1,284,977. CAR SIGNAL SYSTEM; Rex G. Averill, Mansfield, Ohio. App. filed April 19, 1916. For protecting cars from collisions at night in case the current from the normal supply is cut off and they are thus left in darkness.